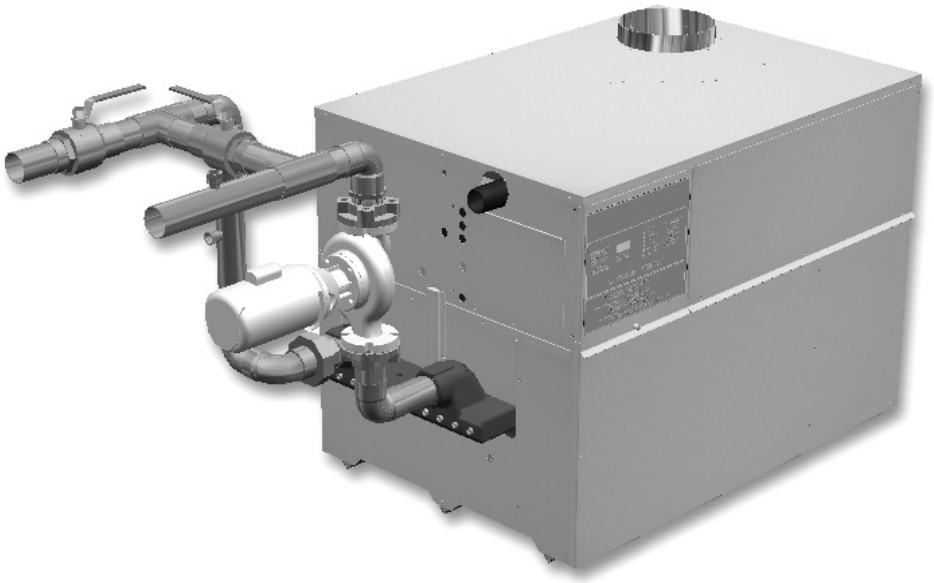
INSTALLATION AND SERVICE MANUAL

GAS HEATERS FOR COMMERCIAL POOL APPLICATIONS
500,000 - 2,070,000 Btu/hr MODELS



⚠ WARNING: If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

– This appliance MUST NOT be installed in any location where gasoline or flammable vapors are likely to be present, unless the installation is such to eliminate the probable ignition of gasoline or flammable vapors.

WHAT TO DO IF YOU SMELL GAS

- **Do not try to light any appliance.**
- **Do not touch any electric switch; do not use any phone in your building.**
- **Immediately call your gas supplier from a neighbors phone. Follow the gas supplier's instructions.**
- **If you cannot reach your gas supplier, call the fire department.**

– Installation and service must be performed by a qualified installer, service agency or the gas supplier.

⚠ WARNING: Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury, exposure to hazardous materials or loss of life. Refer to this manual. Installation and service must be performed by a qualified installer, service agency or the gas supplier. This pool heater contains materials that have been identified as carcinogenic, or possibly carcinogenic, to humans.

⚠ WARNING: Do not use this pool heater if any part has been under water. The possible damage to a flooded pool heater can be extensive and present numerous safety hazards. Any pool heater that has been under water must be replaced.

Save this manual for future reference.

Commercial Pool Heaters

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GENERAL PRODUCT INFORMATION

Special Instructions

This manual supplies information for the installation, operation and servicing of this pool heater. Read and understand this manual completely before installing the pool heater.

Installation and service must be performed by a qualified service installer, service agency, or the gas supplier.

Unpacking

Upon receiving equipment, check for signs of shipping damage. Pay particular attention to parts accompanying the pool heater which may show signs of being hit or otherwise being mishandled. Verify total number of pieces shown on the packing slip with those actually received. In case there is damage or a shortage, immediately notify the carrier.

Codes

The equipment shall be installed in accordance with those installation regulations in force in the local area where the installation is to be made. These shall be carefully followed in all cases. Authorities having jurisdiction shall be consulted before installations are made. In the absence of such requirements, the installation shall conform to the latest edition of the National Fuel Gas Code, ANSI Z223.1 and/or CAN/CGA-B149 Installation Code. All pool heater heat exchanger construction conforms to the latest edition of the ASME Boiler and Pressure Vessel Code, Section IV, Part HLW.

Warranty

Factory warranty (shipped with pool heater) does not apply to pool heaters installed or operated improperly. Improper installation or system design causes most operating problems.

1. Excessive water hardness causing a lime build up in the copper tube is not the fault of the equipment and is not covered under the appliance manufacturer's warranty. (See *Water Chemistry*, page 42).
2. Excessive pitting and erosion on the inside of the copper tube may be caused by too much water velocity through the tubes and is not covered by the appliance manufacturer's warranty (see *Temperature Rise Chart* on page 42 for flow requirements).

SAFETY INFORMATION

The information contained in this manual is intended for use by qualified professional installers, service technicians or gas suppliers. Consult your local expert for proper installation or service procedures.

IMPORTANT: Read this owner's manual carefully and completely before trying to install, operate, or service this pool heater. Improper use of this pool heater can cause serious injury or death from burns, fire, explosion, electrical shock, and carbon monoxide poisoning.

⚠ DANGER: **Carbon Monoxide poisoning may lead to death!**

IMPORTANT: Consult and follow local building and fire regulations and other safety codes that apply to this installation. Consult your local gas utility company to authorize and inspect all gas and flue connections.

⚠ WARNING: **Should overheating occur or the gas supply fail to shut off, do not turn off or disconnect the electrical supply to the pump. Instead, shut off the gas supply at a location external to the pool heater.**

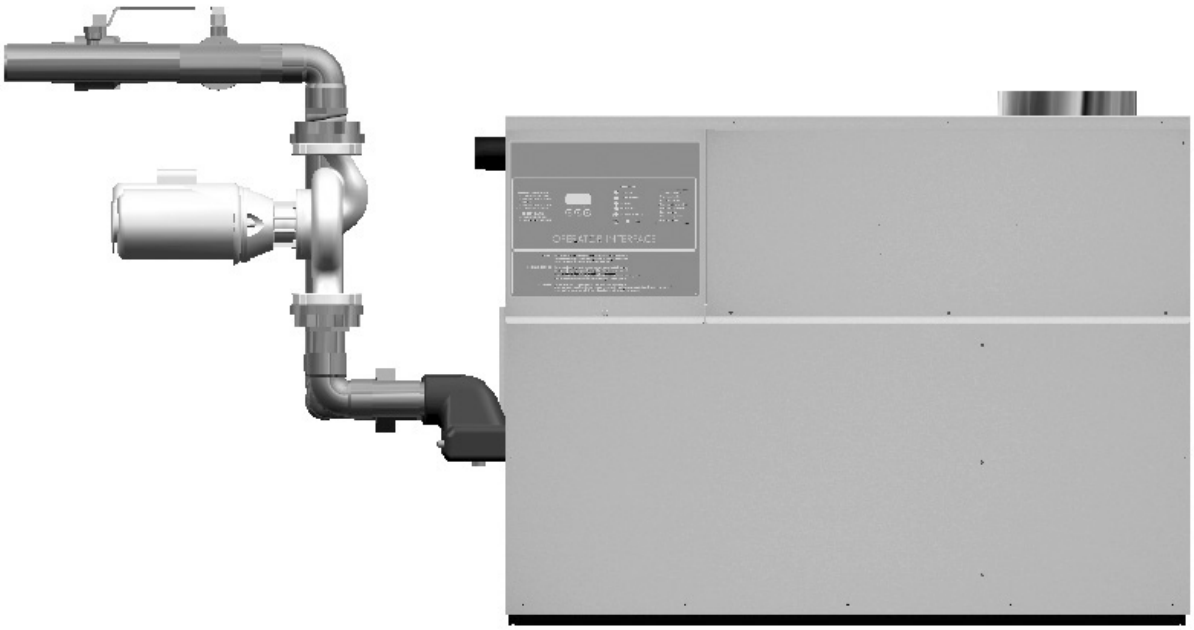
⚠ WARNING: **To minimize the possibility of serious personal injury, fire or damage to your pool heater, never violate the following safety rules.**

1. Pool heaters are heat producing appliances. To avoid damage or injury, do not store materials against the pool heater or the vent-air intake system. Use proper care to avoid unnecessary contact (especially children) with the pool heater and vent-air intake components.
2. Never cover your pool heater, lean anything against it, store trash or debris near it, stand on it, or in any way block the flow of fresh air to your pool heater.
3. UNDER NO CIRCUMSTANCES must flammable materials such as gasoline or paint thinner be used or stored in the vicinity of this pool heater, vent-air intake system or any location from which fumes could reach the pool heater or vent-air intake system.
4. This pool heater is only for use with the type of gas indicated on the rating plate.
5. If you smell gas shut off gas supply.

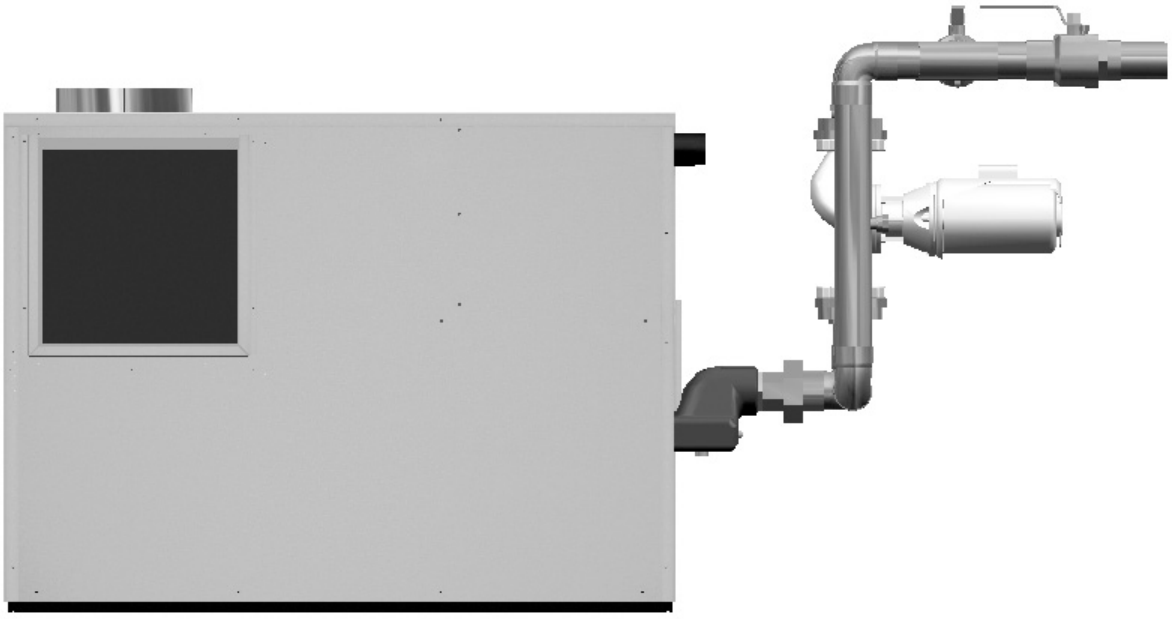
- do not try to light any appliance
- do not touch any electrical switch; do not use any phone in your building
- immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions
- if you cannot reach your gas supplier, call the fire department

6. This appliance is a high efficiency pool heater which has been designed to operate scale-free and trouble free for many years. Particular attention should be directed to the following items.
   - Correct adjustment of the pool heater's pumped bypass and valves.
   - Required minimum inlet temperature to the pool heater.
   - Correct piping to the pool filter system with specified pipe materials and size.
   - Electrical interconnection of the pool heater controls, bypass pump and filter pump to ensure continuous circulation.
   - Proper venting.
   - Water chemistry.
7. Follow all clearances from combustibles contained in this manual.
8. Appliance surfaces become hot during operation. Be careful not to touch hot surfaces. Keep all adults, children, and animals away from an operating pool heater. Severe burns can occur.
9. This pool heater must have an adequate supply of fresh air during operation for proper gas combustion and venting.
10. Make sure all exhaust venting is properly installed and maintained. Improper venting of this pool heater could lead to increased levels of carbon monoxide.
11. Do not use this pool heater if any part has been under water. Immediately call a qualified service technician to replace the pool heater. The possible damage to a flooded pool heater can be extensive and present numerous safety hazards. Any appliance that has been under water must be replaced.
12. Do not alter this pool heater in any way. Any change to this pool heater or its controls can be dangerous.

PRODUCT IDENTIFICATION



Front View



Rear View

Figure 1 – Front and Rear View

***NOTE**:* Standard horizontal piping loop shown. Vertical piping loop available as an option (see Figure 42).

INSTALLATION

This pool heater meets the safe lighting performance criteria with the gas manifold and control assembly provided, as specified in the ANSI Z21.10.3/CSA 4.3 standard for gas-fired water heaters.

LOCATING POOL HEATER

1. Maintain all clearances from combustible construction when locating pool heater. See Clearances from Combustible Construction, this page.
2. Locate the pool heater so that if water connections should leak, water damage will not occur. When such locations cannot be avoided, install a suitable drain pan that is well-drained under the pool heater. The pan must not restrict combustion air flow. The pool heater manufacturer is not responsible for water damage in connection with this pool heater, or any of its components.
3. Install the indoor pool heaters so that the ignition system components are protected from any water while operating or during service.
4. You must install the pool heater on a level, non-combustible floor.
5. Do not install pool heater directly on carpet or other combustible material. A concrete-over-wood floor is not considered non-combustible. Maintain required clearances from combustible surfaces.
   If installing the pool heater in an area with a combustible floor, you must construct a special combustible floor base. See Base for Combustible Floors, this page.
6. For outdoor models, you must install an optional vent cap. Instructions for mounting the vent cap are included in the venting section. Do not install outdoor models directly on the ground. You must install the outdoor pool heater on a concrete, brick, block, or other non-combustible pad. Outdoor models have additional special location and clearance requirements. See *Outdoor Installation Venting*, page 25. A wind proof cabinet protects the pool heater from weather.

Clearances from Combustible Construction

Maintain minimum specified clearances for adequate operation. Allow sufficient space for servicing pipe connections, pump and other auxiliary equipment, as well as the pool heater. See rating plate for specific service clearance requirements.

Right Side	3" (7.5 cm)
Rear	3" (7.5 cm) (3" min. from any surface)
Left Side	6" (15cm) (24" (0.61m) suggested for service)
Front	Alcove* (30" (0.76m) suggested for service)
Top	3" (7.5cm)
Flue	1" (25.4mm)
Hot Water Pipes	1" (25.4mm)

*An Alcove is a closet without a door.

***NOTE**:* No additional clearance is needed on the right side of the pool heater for the observation port. An observation port is located on both the right and left side of the pool heater.

***NOTE**:* No additional clearances for combustibles are needed for use of the Direct Vent (DV) air inlet assembly.

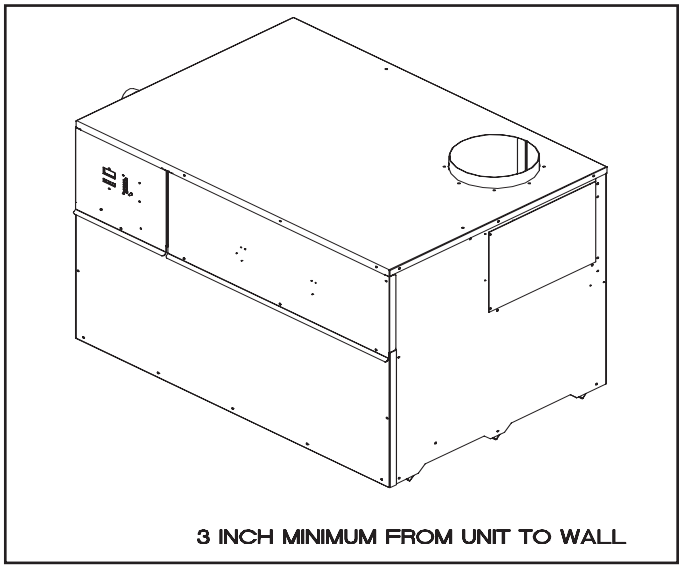


Figure 2 – Clearances from Combustible Construction

Base for Combustible Floors

There are no manufactured combustible floor base kits available for *990,000 - 2,070,000* Btu models. See Table-A for floor base kits that are available.

You must construct a base for combustible floor installation. Install the pool heater over a base of hollow clay tiles or concrete blocks from 8" to 12" thick, extending at least 24" beyond the pool heater sides. Place tiles or blocks so that the holes line up horizontally to provide a clear passage through the tiles or blocks. Place a 1/2" fireproof millboard over the top of the tile or block base. Place a 20-gauge sheet metal cover over the fireproof millboard. Center the pool heater on the base. Also follow this procedure if electrical conduit runs through the floor beneath the pool heater. This base must meet all local fire and safety codes.

TABLE - A COMBUSTIBLE FLOOR KITS Input Btu/hr	Kit Number
500,000	CFK3302
650,000	CFK3303
750,000	CFK3304

FREEZE PROTECTION

Although this pool heater is CSA design certified for outdoor installations - such installations are not recommended in areas where the pool heater will be operated in the winter months and the danger of freezing exists. Proper freeze protection must be provided for outdoor installations, pool heaters installed in unheated mechanical rooms or where temperatures may drop to the freezing point or lower. If freeze protection is not provided for the system, a low ambient temperature alarm is recommended for the mechanical room. Damage to the pool heater by freezing is non-warrantable.

1. Pump Operation - MOST IMPORTANT - This pool heater is designed for continuous operation of the filter system pump when the burners are firing. If the system pump does not run continuously, an additional pump must be installed to provide constant circulation through the pool heater. The constant flow of warm pool water can help prevent freezing.
2. Anytime the temperature measured at the sensor drops below 45°F, the temperature control turns on the pump to circulate the water.
3. Location - Indoor pool heaters must be located in a room having a temperature safely above freezing [32°F(0°C)].
4. Outdoor Pool Heater Installation - Use extreme caution to prevent freezing. A snow screen should be installed to prevent snow and ice accumulation around the pool heater or its venting system.
5. Shut-Down and Draining - If for any reason, the pool heater is to be shut off, the following precautionary measures must be taken:
    1. Shut off gas supply.
    2. Shut off water supply.
    3. Shut off electrical supply.
    4. Drain the pool heater completely. Remove the threaded drain plugs from the inlet and outlet sides of the front header on the heat exchanger (see Figure 3). Blow all water out of the heat exchanger. Leave drains open until Spring.
    5. Drain pump and piping.

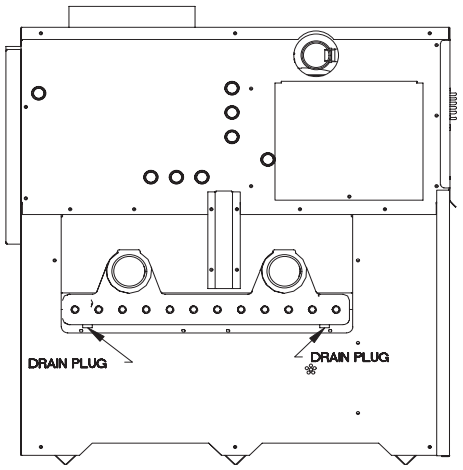


Figure 3 – Draining Pool Heater

⚠ CAUTION: **Under no circumstances should the mechanical room ever be under a negative pressure. Particular care should be taken where exhaust fans, attic fans, clothes dryers, compressors, air handling units, etc., may take away air from the pool heater.**

COMBUSTION AND VENTILATION AIR

Provisions for combustion and ventilation air must be in accordance with Section 5.3, Air for Combustion and Ventilation, of the latest edition of the National Fuel Gas Code, ANSI Z223.1, in Canada, the latest edition of CAN/CGA-B149 Installation Code for Gas Burning Appliances and Equipment, or applicable provisions of the local building codes.

Provide properly-sized openings to the equipment room to assure adequate combustion air and proper ventilation when the pool heater is installed with conventional venting or sidewall venting.

Combustion Air Filter

This pool heater has a standard air filter located at the combustion air inlet. This filter helps ensure clean air is used for the combustion process. Check this filter every month and replace when it becomes dirty. The filter size on the *500,000 - 750,000* units is 12" x 12" x 1" (30.5cm x 30.5cm x 2.5cm) and 16" x 16" x 1 (40.6cm x 40.6cm x 2.5 cm) on the *990,000 - 2,070,000* units. You can find these commercially available filters at any home center or HVAC supply store.

Use filters rated for a maximum face velocity of 300 ft/min at a maximum pressure drop of 0.5" w.c. Pleated filters may be used provided they meet the specifications.

INSTALLATION Continued

⚠ CAUTION: **Some pleated filters are too restrictive and could cause air flow problems.**

For convenience and flexibility, you can direct the combustion air inlet from either the back or right side of the pool heater. To arrange the combustion air inlet for side entry, follow the steps below.

1. Remove the metal panel from the pool heater's side wall (see Figure 4).
2. Remove screws from the air filter/bracket assembly.
3. Move the filter/bracket assembly from the rear of the pool heater to the side opening (see Figure 5).
4. Attach the filter/bracket assembly to the pool heater's side using the pre-drilled screw holes.
5. Attach the metal panel to the rear combustion air opening to seal it off.

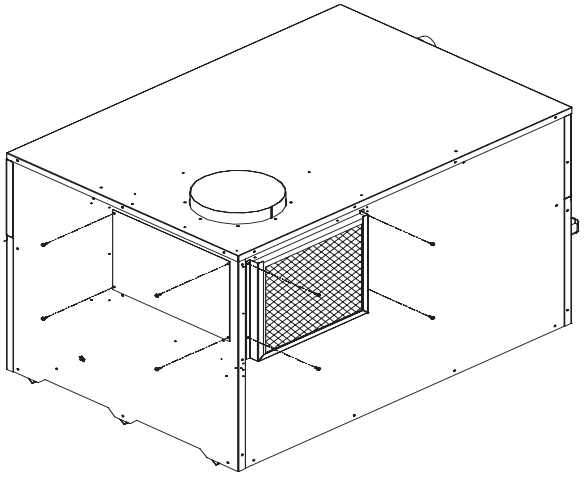


Figure 4 – Metal Panel Covering Side Combustion Air Inlet

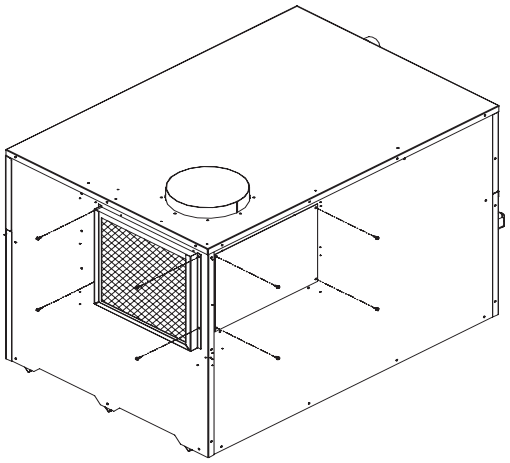


Figure 5 – Moving Air Filter/Bracket Assembly from Rear of Pool Heater to Side

Combustion Air Options

⚠ CAUTION: **Equipment rooms under a negative pressure may cause operational problems. Take particular care where exhaust fans, attic fans, clothes dryers, compressors, air handling units, etc., may take away air from the pool heater.**

This pool heater has four combustion air options.

1. Outside Combustion Air, No Ducts

You can direct outside combustion air to this pool heater using either one or two permanent openings.

One Opening

The opening must have a minimum free area of one square inch per 3000 Btu input (7cm^2 per kW). You must locate this opening within 12" (30cm) of the top of the enclosure.

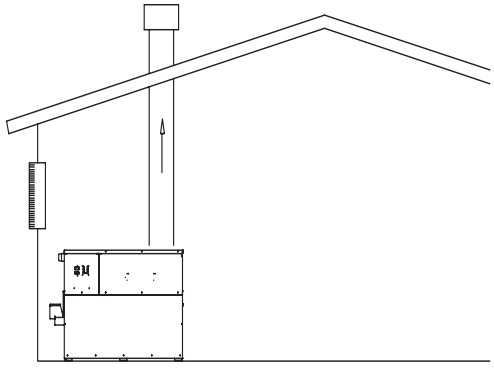


Figure 6 – Outside Combustion Air - Single Opening

Two Openings

The combustion air opening must have a minimum free area of one square inch per 4000 Btu/hr input (5.5cm^2 per kW). You must locate this opening within 12" (30cm) of the bottom of the enclosure.

The ventilation air opening must have a minimum free area of one square inch per 4000 Btu/hr input (5.5cm^2 per kW). You must locate this opening within 12" (30cm) of the top of the enclosure.

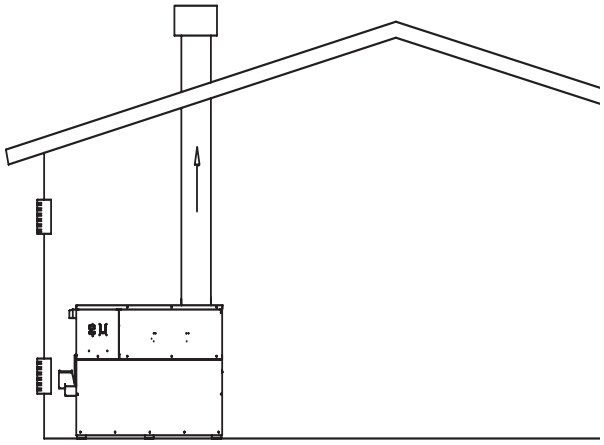


Figure 7 – Outside Combustion Air - Two Openings

2. Outside Combustion Air, Using Ducts

You can direct outside combustion air to this pool heater using two air ducts to deliver the air to the mechanical room. Each of the two openings must have a minimum free area of one square inch per 2000 Btu input (11cm^2 per kW).

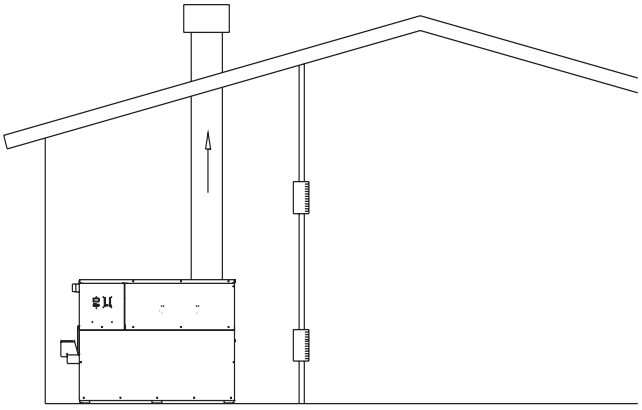


Figure 8 – Outside Combustion Air Through Ducts

3. Outside Combustion Air, Using Direct Venting

With this option, you can connect combustion air vent piping directly to the pool heater. See the information under *Direct Venting* starting on page 21 for specific information regarding this option.

4. Combustion Air from Interior Space

You can direct combustion air to this pool heater using air from an adjoining interior space. You must provide two openings from the mechanical room to the adjoining room.

Each of the two openings must have a net free area of one square inch per 1000 Btu input (22cm^2 per kW), but not less than 100 square inches (645cm^2).

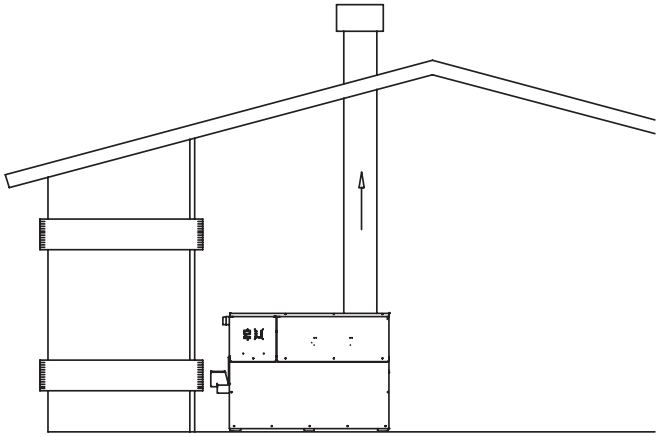


Figure 9 – Combustion Air from Interior Space

All dimensions are based on net free area in square inches. Metal louvers or screens reduce the free area of a combustion air opening a minimum of approximately 25%. Check with louver manufacturers for exact net free area of louvers. Where two openings are provided, one must be within 12" (30 cm) of the ceiling and one must be within 12" (30 cm) of the floor of the mechanical room. Each opening must have a minimum net free area as specified in TABLE–C, page 12. Single openings shall be installed within 12" (30 cm) of the ceiling.

The combustion air supply must be completely free of any flammable vapors that may ignite or chemical fumes which may be corrosive to the pool heater. Common corrosive chemical fumes which must be avoided are fluorocarbons and other halogenated compounds, most commonly present as refrigerants or solvents, such as Freon, trichlorethylene, perchlorethylene, chlorine, etc. These chemicals, when burned, form acids which quickly attack the heat exchanger finned tubes, headers, flue collectors, and the vent system. The result is improper combustion and a non-warrantable, premature pool heater failure.

Exhaust Fans

Any fan or equipment which exhausts air from the mechanical room may deplete the combustion air supply and/or cause a downdraft in the venting system. Spillage of flue products from the venting system into an occupied living space can cause a very hazardous condition that must be immediately corrected. If a fan is used to supply combustion air to the mechanical room, the installer must make sure that it does not cause drafts which could lead to nuisance operational problems with the pool heater.

Vertical DirectAire™ and Horizontal DirectAire™ venting systems have specific requirements for combustion air ducts from the outside which are directly connected to the pool

INSTALLATION Continued

heater. See the requirements for combustion air duct in the venting section starting on page 12.

VENTING

General Information

You must supply adequate combustion and ventilation air to this pool heater. You must provide minimum clearances for the vent terminal from adjacent buildings, windows that open, and building openings. Follow all requirements set forth in the latest edition of the National Fuel Gas Code, ANSI Z223.1, in Canada, the latest edition of CAN/CGA Standard B149 Installation Code for Gas Burning Appliances and Equipment or applicable local building codes. Vent installations for connection to gas vents or chimneys must be in accordance with Part 7, "Venting of Equipment" of the above-mentioned standards.

IMPORTANT: Examine the venting system at least once each year. Check all joints and vent pipe connections for tightness. Also check for corrosion or deterioration. If you find any problems, correct them at once.

Venting Support

Support horizontal portions of the venting system to prevent sagging. Provide an upward slope of at least 1/4 inch per foot (21mm/m) on all horizontal runs from the pool heater to the vertical flue run or to the vent terminal on sidewall venting installations.

Do not use an existing chimney as a raceway if another appliance or fireplace is vented through the chimney. The weight of the venting system must not rest on the pool heater. Provide adequate support of the venting system. Follow all local and applicable codes. Secure and seal all vent connections. Follow the installation instructions from the vent material manufacturer.

Vertical Vent Termination Clearances and Location

The vent terminal should be vertical and exhaust outside the building at least 2 feet (0.61m) above the highest point of the roof within a 10 foot (3.05m) radius of the termination.

The vertical termination must be a minimum of 3 feet (0.91m) above the point of exit.

A vertical termination less than 10 feet (3.05m) from a parapet wall must be a minimum of 2 feet (0.61m) higher than the parapet wall.

You must locate the air inlet termination elbow at least 12" (30cm) above the roof or above normal snow levels.

Keep the vent cap clear of snow, ice, leaves, and debris to avoid blocking the flue.

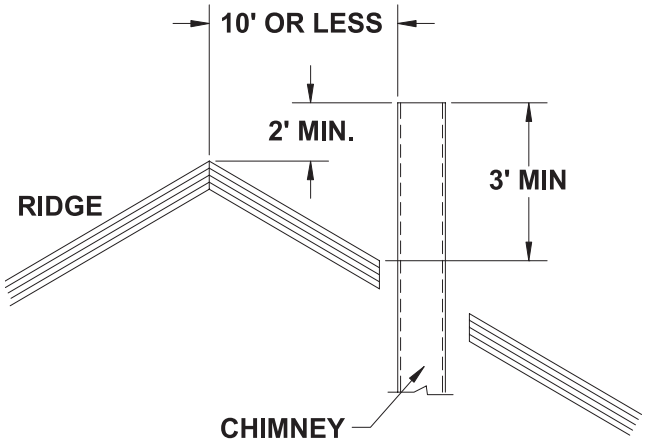


Figure 10 – Vent Termination from Peaked Roof - 10' or Less From Ridge

IMPORTANT: Vent terminations are not shown in Figures 10, 11, 12, and 13. Make sure all vertical vents are installed with vent terminations recommended by the vent manufacturer.

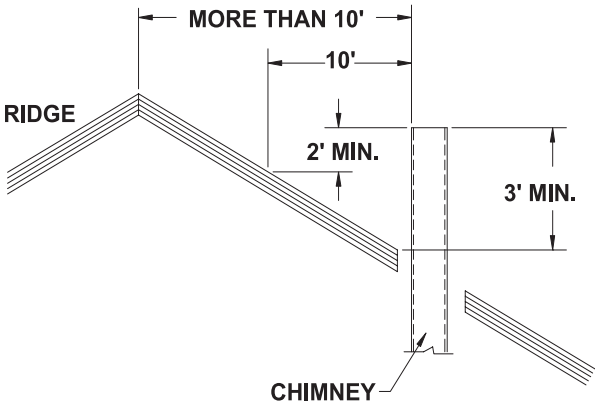


Figure 11 – Vent Termination from Peaked Roof More Than 10' From Ridge

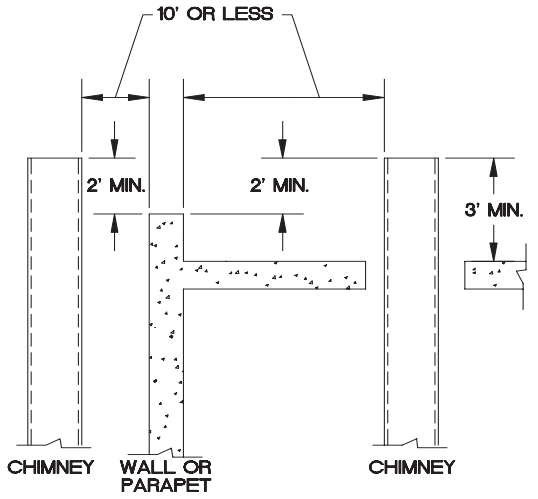


Figure 12 – Vent Termination from Flat Roof 10' or Less from Parapet Wall

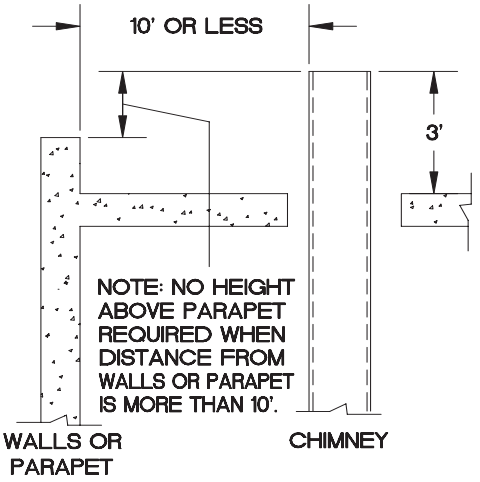

10' OR LESS
3'
NOTE: NO HEIGHT ABOVE PARAPET REQUIRED WHEN DISTANCE FROM WALLS OR PARAPET IS MORE THAN 10'.
WALLS OR PARAPET
CHIMNEY

Figure 13 – Vent Termination from Flat Roof More Than 10' from Parapet Wall

Sidewall Vent Termination Clearances and Location

Locate the bottom of the vent terminal at least 12 inches (30cm) above grade and above normal snow levels. Locate the bottom of the vent terminal at least 7 feet (2.13m) above grade when located adjacent to public walkways. Do not terminate directly above a public walkway.

Do not terminate the venting system in a window well, stairwell, alcove, courtyard, or other recessed area. Do not terminate the venting system below grade.

Locate vent termination at least 3 feet (0.91m) from an inside corner of an L-shaped structure.

Provide a minimum clearance of 4 feet (1.2m) horizontally from electric meters, gas meters, regulators, and relief equipment. Never locate the vent cap above or below electric meters, gas meters, regulators, and relief equipment unless a 4 foot (1.2m) horizontal clearance is maintained.

Terminate the venting system at least 3 feet (0.9m) above any forced air inlet within 10 feet (3.05m).

Terminate the venting system at least 4 feet (1.2m) below, 4 feet (1.2m) beside, or 1 foot (30cm) above any door, window, or gravity air inlet into any building.

Locate vent termination at least 8 feet (2.4m) horizontally from any combustion air intake located above the sidewall termination cap.

⚠ CAUTION: **Pool heaters which are shut down or will not operate may experience freezing due to convective air flow in the flue pipe, through the air inlet, or from negative pressure in the mechanical room. In cold climates, operate pump continuously to help prevent freezing of pool heater water. Provide proper freeze protection. See *Freeze Protection*, page 7.**

TABLE - B
Flue and Air Inlet Pipe Sizes

Input Btu/hr	Flue Size	Air Inlet Size*
500,000	6"	6"
650,000	8"	8"
750,000	8"	8"
990,000	10"	10"
1,260,000	12"	12"
1,440,000	12"	12"
1,800,000	14"	12"
2,070,000	14"	12"

* Minimum diameter for air inlet pipe. Installer may increase diameter one pipe size for ease of installation, if needed. Refer to the National Fuel Gas Code (ANSI Z223.1) Vent Tables for additional guidance on vent sizing of fan assisted appliances.

INSTALLATION Continued

Combustion Air Inlet Piping

⚠ WARNING: **Locate and install the combustion air inlet cap correctly. Failure to do so can allow the discharge of flue products to be drawn into the combustion process. This can result in incomplete combustion and potentially hazardous levels of carbon monoxide in the flue products. This will cause operational problems and the spillage of flue products. Spillage of flue products can cause personal injury or death due to carbon monoxide poisoning.**

The sidewall or vertical rooftop DirectAire™ combustion air supply system has specific vent material and installation requirements. The air inlet pipe connects directly to the pool heater to supply combustion air. In most installations, the combustion air inlet pipe will be a dedicated system with one air inlet pipe per pool heater. You can combine multiple air inlets if the guidelines in *Combined Air Inlet Points*, page 13 are followed. The air inlet pipe will be connected to a combustion air inlet cap as specified in this section.

For normal installations, this system uses a single-wall pipe to supply combustion air from outdoors directly to the pool heater.

In cold climates, use a Type-B doublewall vent pipe or an insulated single wall pipe for combustion air. This will help prevent moisture in the cool incoming air from condensing and leaking from the inlet pipe.

NOTE: When the use of the DV box adapter in the following venting systems is not practical, contact the manufacturer for an “in-line” filter to address problems.

Length of Air Inlet Pipe

The installed length of air inlet pipe from the pool heater to the outside air inlet cap must not exceed 50 equivalent feet (15.2m). Upsizing air inlet pipe diameters is permitted to meet increased length requirements. Subtract 5 feet (1.5m) of equivalent length for each 90° elbow. Subtract 2.5 feet (0.7m) of equivalent length for each 45° elbow.

Do not exceed the limits for the combustion air inlet piping lengths.

Sidewall Air Inlet

The sidewall air inlet cap is supplied in the Horizontal DirectAire™ Vent Kit. Order the kit from the appliance manufacturer. This sidewall cap supplies combustion air for a single pool heater only. See TABLE–D, page 17, for kit numbers.

Locate the pool heater as close as possible to the sidewall where you will install the combustion air supply system.

TABLE-C
Minimum Recommended Combustion Air Supply to Mechanical Room

	Combustion Air Source		
Boiler Input	**Outside Air*/2 Openings**	**Outside Air*/1 Opening**	**Inside Air/2 Openings**
500,000	125 in^2 (806 cm^2)	167 in^2 (1077 cm^2)	500 in^2 (3226 cm^2)
650,000	163 in^2 (1052 cm^2)	217 in^2 (1400 cm^2)	650 in^2 (4194 cm^2)
750,000	188 in^2 (1213 cm^2)	250 in^2 (1613 cm^2)	750 in^2 (4839 cm^2)
990,000	248 in^2 (1,600cm^2)	330 in^2 (2,129 cm^2)	990 in^2 (6,388 cm^2)
1,260,000	315 in^2 (2,032cm^2)	420 in^2 (2,710 cm^2)	1260 in^2 (8,130 cm^2)
1,440,000	360 in^2 (2,323cm^2)	480 in^2 (3,097 cm^2)	1440 in^2 (9,291 cm^2)
1,800,000	450 in^2 (2,903cm^2)	600 in^2 (3,871 cm^2)	1800 in^2 (11,614 cm^2)
2,070,000	518 in^2 (3,342cm^2)	690 in^2 (4,452 cm^2)	2070 in^2 (13,356 cm^2)

*Outside air openings shall directly communicate with the outdoors. When combustion air is drawn from the outside through a duct, the net free area of each of the two openings must have twice (2 times) the free area required for Outside Air/2 Openings. The above requirements are for the boiler only, additional gas fired units in the boiler room will require an increase in the net free area to supply adequate combustion air for all units. Combustion air requirements are based on the latest edition of the National Fuel Gas Code, ANSI Z223.1, in Canada refer to CAN/CGA-B149 Installation Code. Check all local code requirements for combustion air.

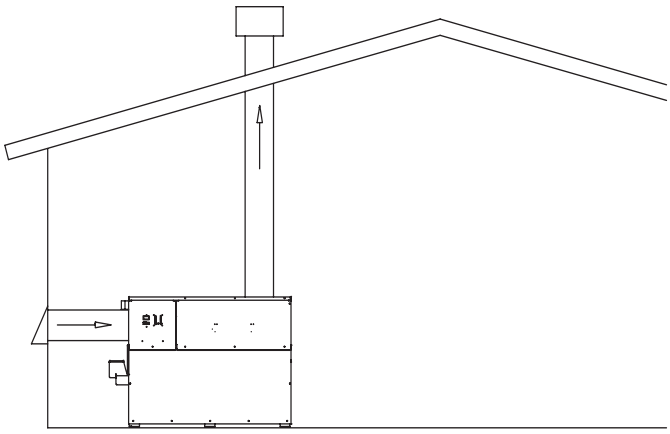


Figure 14 – Sidewall Combustion Air Inlet

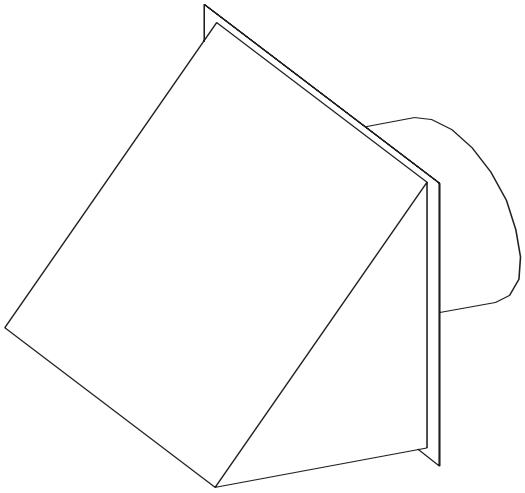


Figure 15 – Air Inlet Cap for Sidewall Termination

To prevent recirculation of flue products from an adjacent vent cap into the combustion air inlet, follow all applicable clearance requirements in the latest edition of the National Fuel Gas Code and/or CAN/CGA-B149 Installation Code and instructions in the Installation and Service Manual.

You must install the combustion air inlet cap at least one foot (0.30m) above ground level and above normal snow levels.

The point of termination for the combustion air inlet cap must be at least 3 feet (0.91m) below the point of flue gas termination (powered vent cap) if it is located within 10 feet (3.05m) of the flue outlet from the powered vent cap. Make sure to properly install the air inlet cap assembly on the air inlet pipe.

You must install the combustion air inlet cap and the powered vent cap on the same wall and in the same pressure zone. Do not install the combustion air inlet cap closer than 10 feet (3.05m) from an inside corner of an L-shaped structure.

Vertical Rooftop Air Inlet

Use the vertical air inlet terminations available from the pool heater manufacturer, recommended and/or supplied by the vent manufacturer, or use two 90° elbows as described on page 24.

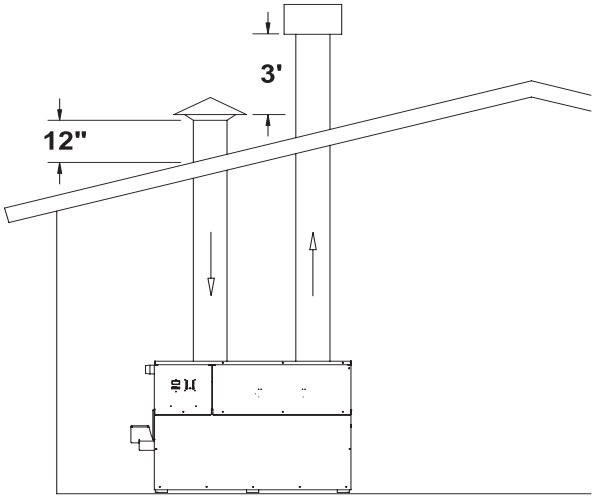


Figure 16 – Roof Top Combustion Air Inlet

Clearances

You must locate the air inlet termination elbow at least 12" (30cm) above the roof or above normal snow levels.

If the air inlet cap is within a 10-foot (3.05m) radius of the flue outlet, the point of termination for the combustion air inlet cap must be at least 3 feet (0.91m) below the point of flue gas termination (vent cap).

Do not install the combustion air inlet cap closer than 10 feet (3.05m) from an inside corner of an L-shaped structure.

Combined Air Inlet Points

The air inlet pipes from multiple pool heaters can be combined to a single common connection if the common air inlet pipe has a cross sectional area equal to or larger than the total area of all air inlet pipes connected to the common air inlet pipe.

Example: Two 10" air inlet pipes (78.5 in^2 area each) have a total area of 157 in^2 and will require a 15" (176.7 in^2 area) common air inlet pipe.

The air inlet point for multiple pool heater air inlets must be provided with an exterior opening which has a free area equal to or greater than the total area of all air inlet pipes connected

INSTALLATION Continued

to the common air inlet. This exterior opening for combustion air must connect directly to the outdoors. The total length of the combined air inlet pipe must not exceed a maximum of 50 (15.2m) equivalent feet. Subtract 5 feet (1.5m) for each 90° elbow in the air inlet pipe. You must deduct the restriction in the area provided by any screens, grills or louvers installed in the common air inlet point. These are common on the sidewall air inlet openings. Screens, grills or louvers installed in the common air inlet can reduce the free area of the opening from 25% to 75% based on the materials used.

Vent System Options

This pool heater has six venting options.

1. Conventional Negative Draft Venting
This option uses a vertical rooftop flue termination. Combustion air is supplied from the mechanical room.

2. Vertical DirectAire™ Venting
This option uses a vertical conventional vent for flue products. Combustion air is supplied by a pipe from the sidewall or rooftop. See page 16 for venting details.

3. Sidewall Venting
This option uses a powered vent assembly to exhaust the flue products out a sidewall vent termination. Combustion air is supplied from the mechanical room. See page 17 for venting details.

4. Horizontal DirectAire™ Venting
This option uses a powered vent assembly to exhaust the flue products out a sidewall. Combustion air is supplied by a pipe from the sidewall. See page 20 for venting details.

5. Direct Venting
This option uses a sealed AL29-4C flue and a separate combustion air pipe to the outdoors. This system terminates both the flue and combustion air inlet in the same pressure zone. The flue outlet and combustion air intake may terminate at either a sidewall (horizontal) or the rooftop (vertical). See page 21 for venting details.

6. Outdoor Installation Venting
This option uses the installation of a special air inlet/vent cap on top of the pool heater. See page 25 for venting details.
All pool heaters are shipped from the factory equipped for conventional negative draft venting. All other optional vent systems require the installation of specific vent kits and venting materials. The following is a detailed explanation of the installation requirements for each venting system, components used and part numbers of vent kits for each model.

Barometric Damper Location

Any venting system option that requires a barometric damper must adhere to the following directions for optimum performance.

The preferred location for the barometric damper is in a tee or collar installed in the vertical pipe rising from the pool heater's flue outlet. The barometric damper MUST NOT be installed in a bull head tee installed on the pool heater's flue outlet. **The tee or collar containing the barometric damper should be approximately <u>three feet</u> vertically above the connection to the pool heater's flue outlet.** This location ensures that any positive velocity pressure from the pool heater's internal combustion fan is dissipated and the flue products are rising due to buoyancy generated from the temperature of the flue products. Adjust weights on the damper to ensure that draft is maintained within the specified range.

1. Conventional Negative Draft Venting

IMPORTANT: Before installing the venting system, follow all venting clearances and requirements found in the *Venting, General Information* section, page 10.

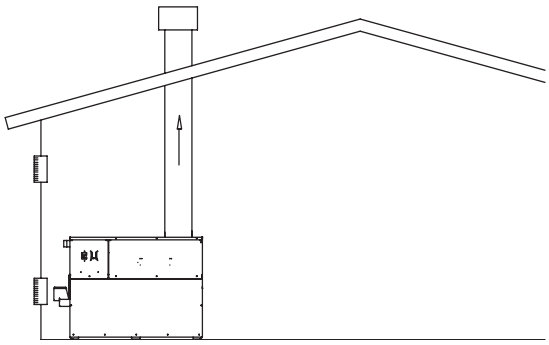


Figure 17 – Conventional Negative Draft Vertical Venting with Combustion Air Louvers

This option uses Type-B doublewall flue outlet piping. The blower brings in combustion air. The buoyancy of the heated flue products cause them to rise up through the flue pipe. The flue outlet terminates at the rooftop.

Negative Draft

The negative draft in a conventional vent installation must be within the range of 0.02 to 0.08 inches w.c. to ensure proper operation. Make all draft readings while the pool heater is in stable operation (approximately 2 to 5 minutes).

Connect the flue vent directly to the flue outlet opening on the top of the pool heater. No additional draft diverter or barometric damper is needed on single unit installations with a dedicated stack and a negative draft within the specified range of 0.02 to 0.08 inches w.c. If the draft in a dedicated stack for a single pool heater installation exceeds the maximum specified draft, you must install a barometric damper to control draft. Multiple pool heater installations with combined venting or common venting with other Category I negative draft appliances require each pool heater to have a barometric damper installed to regulate draft within the proper range.

Do Not connect vent connectors serving appliances vented by natural draft (negative draft) to any portion of a mechanical draft system operating under positive pressure. Connecting to a positive pressure stack may cause flue products to be discharged into the living space causing serious health injury.

Flue Outlet Piping

With this venting option, you must use Type-B doublewall (or equivalent) vent materials. Vent materials must be listed by a nationally-recognized test agency for use as vent materials. Make the connections from the pool heater vent to the outside stack as direct as possible with no reduction in diameter. Use the National Fuel Gas Code venting tables for doublewall vent to properly size all vent connectors and stacks. Follow the vent manufacturer's instructions when installing Type-B vents and accessories, such as firestop spacers, vent connectors, thimbles, caps, etc.

Provide adequate clearance to combustibles for the vent connector and firestop.

When planning the venting system, avoid possible contact with plumbing or electrical wiring inside walls, ceilings, and floors. Locate the pool heater as close as possible to a chimney or gas vent.

Avoid long horizontal runs of the vent pipe, 90° elbows, reductions and restrictions.

No additional draft diverter or barometric damper is required on single unit installations with a dedicated stack and a negative draft maintained between 0.02 to 0.08 inches w.c.

Common Venting Systems

You can combine the flue with the vent from any other negative draft, Category I appliance. Using common venting for multiple negative draft appliances requires you to install a barometric damper with each pool heater. This will regulate draft within the proper range. You must size the common vent and connectors from multiple pool heaters per the venting tables for Type-B doublewall vents in the latest edition of the National Fuel Gas Code, ANSI Z223.1 and/or CAN/CGA-B149 Installation Code. Common venting systems may be too large when an existing pool heater is removed.

At the time of removal of an existing pool heater, the following steps shall be followed with each pool heater remaining connected to the common venting system placed in operation, while other appliances remaining connected to the common venting system are not in operation.

1. Seal any unused opening in the common venting system.
2. Visually inspect the venting system for proper size and horizontal pitch. Make sure there is no blockage or restriction, leakage, corrosion and other unsafe conditions.
3. If possible, close all building doors and windows. Close all doors between the space in which the appliances remaining connected to the common venting system are located and other building spaces.
4. Turn on clothes dryers and any other appliances not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan.
5. Close fireplace dampers.
6. Place in operation the unit being inspected. Follow the lighting instructions. Adjust thermostat so pool heater will operate continuously.
7. Test for spillage of flue gases at the draft hood/relief openings of all appliances connected to the venting system after five minutes of main burner operation.
8. After making sure that each appliance remaining connected to the common venting system properly vents when tested as above, return doors, windows, exhaust fans, fireplace dampers and other gas burning appliances to their previous conditions of use.
9. Correct any improper operation of the common venting system so that the installation conforms to the latest edition of the National Fuel Gas Code, ANSI Z223.1, in Canada, the latest edition of CAN/CGA-B149 Installation Code for Gas Burning Appliances and Equipment. When resizing any portion of the common venting system, resize to approach the minimum size as determined using the appropriate tables of the latest edition of the National Fuel Gas Code, ANSI Z223.1, in Canada, the latest edition of CAN/CGA-B149 Installation Code for Gas Burning Appliances and Equipment.

Masonry Chimney Installations

A masonry chimney must be properly sized for the installation of a high efficiency gas-fired pool heater. Venting of a high efficiency pool heater into a cold or oversized masonry chimney can result in operational and safety problems. Exterior masonry chimneys, with one or more sides exposed to cold outdoor temperatures, are more likely to have venting

INSTALLATION Continued

problems. The temperature of the flue products from a high efficiency pool heater may not be able to sufficiently heat the masonry structure of the chimney to generate proper draft. This will result in condensing of flue products, damage to the masonry flue/tile, insufficient draft and possible spillage of flue products into an occupied living space. Carefully inspect all chimney systems before installation.

Inspection of a Masonry Chimney

A masonry chimney must be carefully inspected to determine its suitability for the venting of flue products. A clay-tile-lined chimney must be structurally sound, straight and free of misaligned tile, gaps between liner sections, missing sections of liner or any signs of condensate drainage at the breeching or clean out. If there is any doubt about the condition of a masonry chimney, it must be relined with a properly-sized and approved chimney liner system. An unlined masonry chimney must not be used to vent flue products from this high-efficiency pool heater. An unlined chimney must be relined with an approved chimney liner system when a new pool heater is being attached to it. Metallic liner systems (Type-B doublewall or flexible or rigid metallic liners) are recommended. Consult with local code officials to determine code requirements or the advisability of using or relining a masonry chimney.

Vertical Vent Termination Clearances and Location

Follow all vertical venting termination information for clearances and location under *Vertical Vent Termination Clearances and Location*, page 10.

2. Vertical DirectAire™ Venting

IMPORTANT: Before installing a venting system, follow all venting clearances and requirements found in the *Venting, General Information* section, page 10.

The Vertical DirectAire™ vent system is the same as the Conventional Negative Draft vent system, except it pulls combustion air from the outdoors through a sidewall or vertical air inlet. Follow all requirements in *Conventional Negative Draft Venting*, page 14.

The Vertical DirectAire™ vent system requires you to install two vent pipes directly to the pool heater; one vertical pipe with a rooftop termination for the flue products and one pipe for combustion air. For this venting option, you must purchase the DV box adapter. The DV box attaches to the air inlet of the pool heater. The pipe for combustion air attaches to the DV box.

You can terminate the combustion air pipe either horizontally with a sidewall air inlet or vertically with a rooftop air inlet.

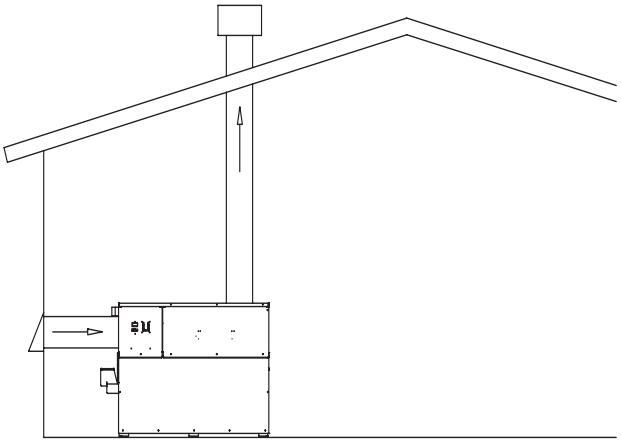


Figure 18 – Vertical DirectAire Installation with Sidewall Combustion Air Inlet

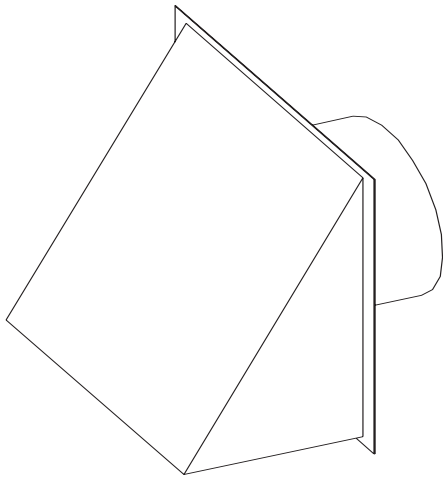


Figure 19 – Air Inlet Cap for Sidewall Termination

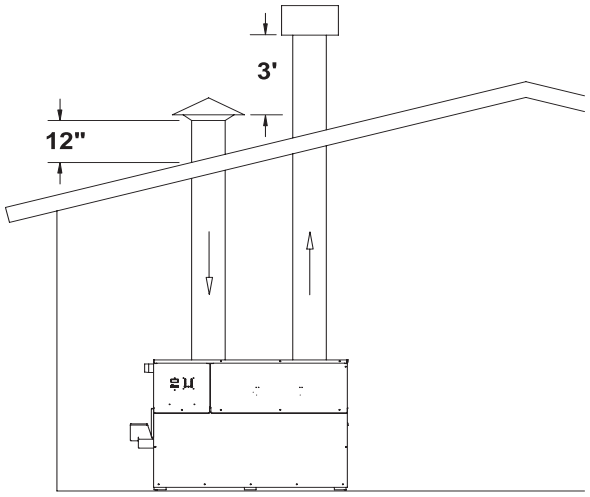


Figure 20 – Vertical DirectAire Installation with Rooftop Combustion Air Inlet

Vent Kits

⚠ WARNING: **Only use a sidewall air inlet cap supplied by the appliance manufacturer or a rooftop air inlet cap supplied by the vent manufacturer. Using any other air inlet cap for single-unit installations or using a common air inlet cap for multiple units with insufficient free area and/or protections from wind and weather may result in operational problems and the spillage of flue products. Spillage of flue products can cause personal injury or death due to carbon monoxide poisoning.**

For single pool heater installations with sidewall air inlet, (see Figure 18) you must order the sidewall air inlet kit. The part number for each SVK kit is listed by input size in TABLE–D.

For single pool heater installations with rooftop air inlet (see Figure 20), you must order the rooftop air inlet kit The part number for each VDK kit is listed by input size in TABLE-D. Purchase the flue pipe, rooftop flue termination, and air inlet pipe locally.

There is no vent kit for combined air supply systems for multiple pool heaters. Make sure the air inlet cap is properly sized. You must purchase this cap locally.

Venting of Flue Products

For venting flue products vertically to the outdoors, follow all requirements in the installation instructions for conventional venting in this manual. Follow all clearance requirements in *Vertical Vent Termination Clearances and Location*, page 10.

A barometric damper is not required in the flue on Vertical DirectAire™ installations if the draft is within the negative 0.04 to 0.08 inches w.c. required for proper operation. If the draft exceeds this range, install a barometric damper.

TABLE-D
DirectAire™ Kits

Input Btu/hr	Horizontal Kit*	Vertical Kit*
500,000	SVK3047	VDK3026
650,000	SVK3048	VDK3027
750,000	SVK3048	VDK3027
990,000	SVK3040	VDK3023
1,260,000	SVK3041	VDK3024
1,440,000	SVK3041	VDK3024
1,800,000	SVK3041	VDK3024
2,070,000	SVK3041	VDK3024

*The SVK kits include a DV box adapter and sidewall air inlet cap. The VDK kits include a DV box adapter and a rooftop air inlet cap. See note on page 12 concerning DV box adapter.

3. Sidewall Venting

IMPORTANT: Before installing a venting system, follow all venting clearances and requirements found in the *Venting, General Information* section, page 10.

This option uses a powered vent assembly which pulls the flue products out of the stack. This fan generates a negative draft at the pool heater. Combustion air is drawn from the mechanical room (see *Combustion and Ventilation Air*, page 7).

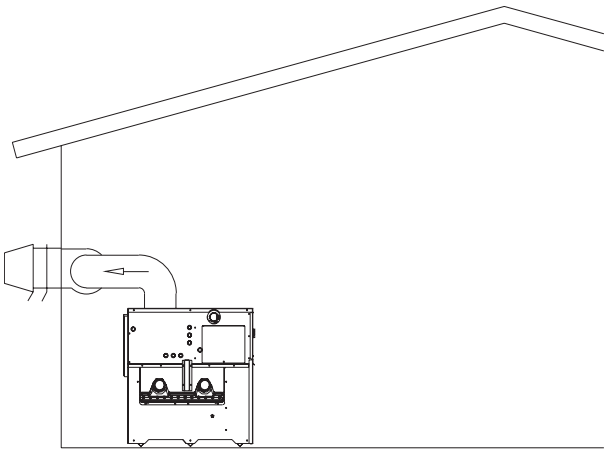


Figure 21 – Sidewall Venting Installation with an Induced Draft Fan and Sidewall Vent Cap

INSTALLATION Continued

Sidewall Fan

The sidewall fan can be mounted on the inside/outside (depending upon model) with a sidewall vent hood installed on the exterior wall. The sidewall fan and accessories are included in a venting kit provided by the appliance manufacturer. See TABLE–E for kit numbers.

The venting kit includes the sidewall fan, vent hood, tapered vent adapter, barometric damper, proving switch and all necessary relays to interlock with the heaters control system. The tapered vent adapter reduces the vent size at the inlet to the fan. There should be no reduction in vent diameter from the pool heater's flue outlet to the sidewall fan. The barometric damper must be installed on the flue and adjusted to supply a negative draft within the range of 0.04 to 0.08 inches w.c. while the pool heater is operating.

Flue Outlet Piping

With this venting option, you must use Type-B doublewall (or equivalent) vent materials. Vent materials must be listed by a nationally-recognized test agency for use as vent materials. Make the connections from the pool heater vent to the sidewall fan/cap as direct as possible with no reduction in diameter. Use the National Fuel Gas Code venting tables for doublewall vent to properly size all vent connectors and stacks. Follow the vent manufacturer's instructions when installing Type-B vents and accessories, such as firestop spacers, vent connectors, thimbles, caps, etc.

When planning the venting system, avoid possible contact with plumbing or electrical wiring inside walls.

The maximum installed length of sidewall vent pipe with an induced draft fan must not exceed 50 feet (15.2m) on the *990,000 - 2,070,000* Btu/hr models or 100 feet (30.5m) on the *500,000 - 750,000* Btu/hr models. Subtract 5 feet (1.5m) for each 90° elbow. Subtract 2.5 feet (0.7m) for each 45° elbow.

Sidewall Venting Termination

The sidewall vent cap must be installed on an exterior sidewall. The sidewall fan/powered sidewall vent cap and accessories are included in a venting kit which is furnished by the pool heater manufacturer in accordance with CSA International requirements. This venting kit includes the powered sidewall fan/cap, proving switch and all necessary relays to interlock with the pool heater's control system.

The sidewall fan/powered vent cap must be interlocked with the pool heater's control system to start the fan on a call for heat and prove fan operation before the pool heater fires. Plug-in and terminal strip connections are provided on the pool heater for easy connection of the factory supplied vent kit and control package for the sidewall vent fan. See the installation instructions provided with the vent kit.

Sidewall Venting Without Fan

For 500,000 - 750,000 Btu/hr models approved for sidewall venting without an external power vent fan, you must install specific vent kits and venting materials. The following is a detailed explanation of *Sidewall Venting Without an External Fan* installation requirements.

Flue Outlet Piping

Venting Guidelines

If using this venting option, a sealed AL29-4C venting system for flue products is required on all models of this pool heater. This venting system operates with a positive pressure in the vent. The internal combustion air blowers generate this positive pressure which operates the combustion process and also exhausts the flue products from the building.

This vent system has specific vent material and installation requirements. Only use listed sealed AL29-4C vent system materials. Follow all installation requirements. See TABLE–B, page 11 for proper pipe size for your pool heater. A list of sealed AL29-4C flue pipe manufacturers is located on page 22.

Seal all vent joints and seams gas-tight.

Drain Tee Installation

A drain tee must be installed in the vent pipe to collect and dispose of any condensate that may occur in the vent system. The drain tee must be installed as the first fitting after the horizontal ell on the top of the unit (see Figure 22A). Plastic drain tubing, sized per the vent manufacturer's instructions, shall be provided as a drain line from the tee. The drain tubing must have a trap provided by a 3" (7.6cm) diameter circular trap loop in the drain tubing. Prime the trap loop by pouring a small quantity of water into the drain hose before assembly to the vent. Secure the trap loop in position with nylon wire ties. Use caution not to collapse or restrict the condensate drain line with the nylon wire ties. The condensate drain must be routed to a suitable drain for disposal of condensate that may occur in the direct vent system. Refer to the condensate drain installation instructions as supplied by the manufacturer of the vent material.

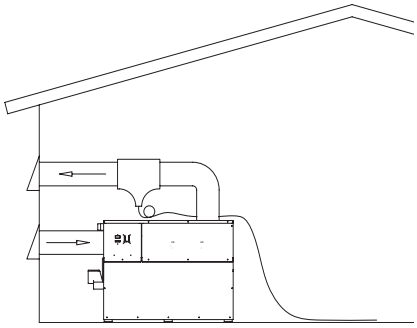


Figure 22A – Direct Vent (Illustration with Sidewall Vent and Sidewall Combustion Air)

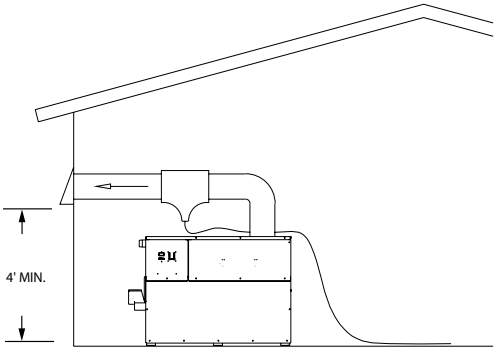


Figure 22B – Sidewall Venting

> ⚠ WARNING: **Do not combine the flue from this unit with the vent from any other appliance. Do not combine flues from multiple appliances into a common vent. The flue from this unit must be a dedicated stack.**

Connect the flue vent directly to the flue outlet opening on the top of the pool heater. Make the connections from the pool heater vent to the outside stack as direct as possible with no reduction in diameter. Provide adequate clearance to combustibles for the vent connector and firestop. Follow the vent manufacturer's instructions when installing sealed AL29-4C vents and accessories, such as firestop spacers, vent connectors, thimbles, caps, etc.

Provide adequate clearance to combustibles for the vent connector and firestop.

When planning the venting system, avoid possible contact with plumbing or electrical wiring inside walls, ceilings, and floors. Locate the pool heater as close as possible to the chimney or gas vent. When a vent system is disconnected for any reason, the flue must be reassembled and resealed according to the vent manufacturer's instructions.

The installed length of flue from the pool heater to the outside point of termination must not exceed 50 equivalent feet (15.2m). Subtract 5 feet (1.5m) of equivalent length for each 90° elbow. Subtract 2.5 feet (0.7m) of equivalent length for each 45° elbow.

Masonry Chimney Installation

Do not use a standard masonry chimney to directly vent the combustion products from this pool heater.

To use a masonry chimney, the chimney must use a sealed, corrosion-resistant liner system. Sealed, corrosion-resistant liner systems (singlewall, doublewall, flexible, or rigid) must be rated for use with a high efficiency, positive pressure vent system.

Corrosion-resistant chimney liner systems are typically made from a high grade stainless steel such as AL29-4C. The liner must be properly sized and fully sealed throughout the entire length. Both the top and bottom of the masonry chimney must be capped and sealed to provide a dead air space around the liner.

> ⚠ WARNING: **Do not vent this pool heater into a masonry chimney without a sealed stainless steel liner system. Any breaks, leaks, or damage to the masonry flue/tile will allow the positive-pressure flue products to leak from the chimney and into occupied living spaces. This could cause serious injury or death due to carbon monoxide poisoning and other harmful flue products.**

> **IMPORTANT: Check with local code officials to determine code requirements or the advisability of using a masonry chimney with a sealed corrosion-resistant liner system.**

Sidewall Vent Termination Clearances and Location

Follow all sidewall venting termination information for clearances and location under *Sidewall Vent Termination Clearances and Location*, page 11.

INSTALLATION Continued

TABLE-E
Sidewall Vent Kits

Input Btu/hr	Kit* (w/Power Fan Assy.)	Max. Vent Length	Vent Termination Only (500,000 - 750,000 Btu/hr)	Max. Vent Length
500,000	SVK3006	100 ft.	SVK3043	50 ft.
650,000	SVK3008	100 ft.	SVK3044	50 ft.
750,000	SVK3008	100 ft.	SVK3044	50 ft.
990,000	SVK3009	50 ft.	N/A	N/A
1,260,000	SVK3010	50 ft.	N/A	N/A
1,440,000	SVK3010	50 ft.	N/A	N/A
1,800,000	SVK3012	50 ft	N/A	N/A
2,070,000	SVK3012	50 ft.	N/A	N/A

*These kits include a sidewall venter assembly, vent termination, and barometric damper. Pool heaters not equipped with this option will require Field Conversion Kit 3016.

4. Horizontal DirectAire™ Venting

IMPORTANT: Before installing a venting system, follow all venting clearances and requirements found in the *Venting, General Information* section, page 10.

The Horizontal DirectAire™ vent system is the same as the Sidewall Venting system, except it pulls combustion air from the outdoors through a sidewall air inlet. Follow all requirements in *Sidewall Venting*, page 17.

The Horizontal DirectAire™ vent system requires you to install two vent pipes directly to the pool heater; one pipe for flue products and one for combustion air. Install both vent pipes horizontally with a sidewall termination point. For this venting option, you must purchase the DV box accessory from the pool heater manufacturer. The DV box attaches to the air inlet of the pool heater. The pipe for combustion air attaches to the DV box.

Make vent connection directly to the top of the pool heater. No additional draft diverter or barometric damper is required on single unit installations with a dedicated stack and a negative draft maintained between 0.04 to 0.08 inches w.c.

The Horizontal DirectAire™ combustion air supply system has specific vent material and installation requirements. The air inlet pipe connects directly to the pool heater to supply combustion air. The combustion air inlet pipe is a dedicated system with one air inlet pipe per pool heater. You must connect the air inlet pipe to a combustion air inlet cap as specified in this section.

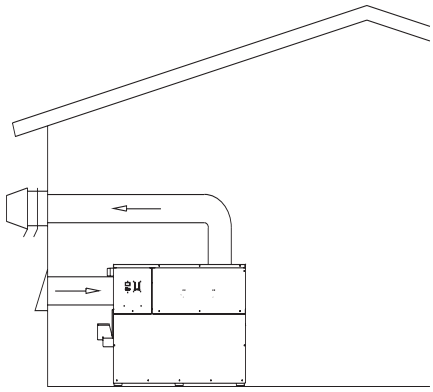


Figure 23 – Horizontal DirectAire Installation (Illustration with Sidewall Venter and Sidewall Combustion Air)

Combustion air supplied from outdoors must be free of contaminants (see *Combustion and Ventilation Air*, page 7).

Vent Kits

You must order the Horizontal DirectAire™ Vent Kit for sidewall installation. See TABLE–F for kit numbers. Each kit includes a sidewall powered vent cap, proving switch, controls, combustion air inlet cap to supply air to a single pool heater, the transition adapter to attach the field supplied single wall air inlet pipe to the pool heater and installation instructions. Purchase flue pipe and air inlet pipe locally.

The sidewall air inlet cap supplied in the Horizontal DirectAire™ Vent Kit is used to supply combustion air to a single pool heater. Combustion air supply pipes from multiple pool heaters can not be combined into a single air inlet pipe and inlet point.

⚠ WARNING: **Only use the sidewall air inlet cap recommended by the appliance manufacturer. Using another sidewall air inlet cap may result in operational problems and the spillage of flue products. Spillage of flue products can cause personal injury or death due to carbon monoxide poisoning.**

Venting of Flue Products

For venting flue products horizontally, follow all requirements in the installation instructions for sidewall venting.

Termination point for the flue products must follow the clearance requirements in *Sidewall Venting Termination, Clearances and Location* page 11.

For proper operation, a barometric damper is provided for Horizontal DirectAire™ installations. The damper will help to ensure a draft between negative 0.04 to 0.08 inches w.c.

TABLE-F
Horizontal DirectAire™ Kits

Input Btu/hr	Kit*
500,000	HDK3031
650,000	HDK3032
750,000	HDK3032
990,000	HDK3026
1,260,000	HDK3027
1,440,000	HDK3027
1,800,000	HDK3028
2,070,000	HDK3028

*These kits include a sidewall venter assembly, vent termination, DV box adapter, sidewall air inlet cap, and a barometric damper. See note on page 12 concerning DV box adapter.

5. Direct Venting

IMPORTANT: Before installing a venting system, follow all venting clearances and requirements found in the *Venting, General Information* section, page 10.

This option uses sealed AL29-4C vent materials for the flue outlet piping and separate combustion air inlet piping. This system terminates both the flue and combustion air inlet in the same pressure zone. The flue outlet and combustion air intake may terminate at either a sidewall or the rooftop.

To use the optional Direct Vent system, you must install specific vent kits and venting materials. The following is a detailed explanation of Direct Vent installation requirements, including the components used and vent kit part numbers.

Flue Outlet Piping

Venting Guidelines

If using this venting option, a sealed AL29-4C venting system for flue products is required on all models of this pool heater. This venting system operates with a positive pressure in the vent. The internal combustion air blowers generate this positive pressure which operates the combustion process and also exhausts the flue products from the building.

This vent system has specific vent material and installation requirements. Only use listed sealed AL29-4C vent system materials. Follow all installation requirements. See TABLE–B, page 11 for proper pipe size for your pool heater. A list of sealed AL29-4C flue pipe manufacturers is located on page 22.

Seal all vent joints and seams gas-tight.

Drain Tee Installation

A drain tee must be installed in the vent pipe to collect and dispose of any condensate that may occur in the vent system. The drain tee must be installed as the first fitting after the horizontal ell on the top of the unit (see Figure 22A). Plastic drain tubing, sized per the vent manufacturer's instructions, shall be provided as a drain line from the tee. The drain tubing must have a trap provided by a 3" (7.6cm) diameter circular trap loop in the drain tubing. Prime the trap loop by pouring a small quantity of water into the drain hose before assembly to the vent. Secure the trap loop in position with nylon wire ties. Use caution not to collapse or restrict the condensate drain line with the nylon wire ties. The condensate drain must be routed to a suitable drain for disposal of condensate that may occur in the direct vent system. Refer to the condensate drain installation instructions as supplied by the manufacturer of the vent material.

⚠ WARNING: **Do not combine the flue from this unit with the vent from any other appliance. Do not combine flues from multiple appliances into a common vent. The flue from this unit must be a dedicated stack.**

Connect the flue vent directly to the flue outlet opening on the top of the pool heater. Make the connections from the pool heater vent to the outside stack as direct as possible with no reduction in diameter. Provide adequate clearance to combustibles for the vent connector and firestop. Follow the vent manufacturer's instructions when installing sealed AL29-4C vents and accessories, such as firestop spacers, vent connectors, thimbles, caps, etc.

Provide adequate clearance to combustibles for the vent connector and firestop.

When planning the venting system, avoid possible contact with plumbing or electrical wiring inside walls, ceilings, and floors. Locate the pool heater as close as possible to the chimney or gas vent. When a vent system is disconnected for any reason, the flue must be reassembled and resealed according to the vent manufacturer's instructions.

The installed length of flue from the pool heater to the outside point of termination must not exceed 50 equivalent feet (15.2m). Subtract 5 feet (1.5m) of equivalent length for each

INSTALLATION Continued

90° elbow. Subtract 2.5 feet (0.7m) of equivalent length for each 45° elbow.

Masonry Chimney Installation

Do not use a standard masonry chimney to directly vent the combustion products from this pool heater.

To use a masonry chimney, the chimney must use a sealed, corrosion-resistant liner system. Sealed, corrosion-resistant liner systems (singlewall, doublewall, flexible, or rigid) must be rated for use with a high efficiency, positive pressure vent system.

Corrosion-resistant chimney liner systems are typically made from a high grade stainless steel such as AL29-4C. The liner must be properly sized and fully sealed throughout the entire length. Both the top and bottom of the masonry chimney must be capped and sealed to provide a dead air space around the liner.

⚠ WARNING: **Do not vent this pool heater into a masonry chimney without a sealed stainless steel liner system. Any breaks, leaks, or damage to the masonry flue/tile will allow the positive-pressure flue products to leak from the chimney and into occupied living spaces. This could cause serious injury or death due to carbon monoxide poisoning and other harmful flue products.**

IMPORTANT: Check with local code officials to determine code requirements or the advisability of using a masonry chimney with a sealed corrosion-resistant liner system.

Vertical DV Venting Termination

You must use the vent termination recommended by the vent manufacturer for vertical direct vent terminations. Follow all vertical venting termination information for clearances and location under *Vertical Vent Termination Clearances and Location*, page 10.

Horizontal DV Venting Termination

Horizontal venting uses the pool heater's internal combustion air blowers to force the flue products out of the horizontally-terminated flue.

You must purchase a horizontal direct vent kit from the pool heater manufacturer to ensure proper operation. See TABLE–G, this page, to determine which horizontal direct vent kit you need.

When installing the vent cap, the wall opening must provide an air space clearance of 2 inches (5.1cm) around the flue pipe. The diameter of the opening for installation of the sidewall cap will be 4 inches (10.2cm) larger (minimum) than the nominal diameter of the installed vent pipe to the horizontal vent cap.

Install the horizontal vent cap from the outside. Mount the vent cap to the wall using four screws or wall anchors. Seal under the screw heads with caulking. Install the sealed, AL29-4C vent pipe from the pool heater to the vent cap. See detailed instructions packed with the horizontal direct vent kit.

Horizontal Vent Termination Clearances and Location

Follow all sidewall venting termination information for clearances and location under *Sidewall Vent Termination Clearances and Location*, page 11.

TABLE-G
Direct Vent Kits

Input Btu/hr	Horizontal Kit*	Vertical Kit*
500,000	DVK3004	VDK3026
650,000	DVK3005	VDK3027
750,000	DVK3005	VDK3027
990,000	DVK3000	VDK3023
1,260,000	DVK3001	VDK3024
1,440,000	DVK3001	VDK3024
1,800,000	DVK3002	VDK3024
2,070,000	DVK3002	VDK3024

* The DVK kit includes a DV box adapter, air inlet cap, and a sidewall vent termination. The VDK kit includes a DV box adapter and an air inlet cap. See note on page 12 concerning DV box adapter.

Flue Pipe Materials

The following manufacturers supply flue materials suitable for these models. All materials are made with AL29-4C stainless steel. Call the numbers below for the nearest distributor.

Heat-Fab, Inc. Saf-T CI Vent. 1-800-772-0739.

Protech Systems, Inc. Fas-N-Seal Vent. 1-800-766-3473.

Metal-Fab, Inc. Corr/Guard Vent. 1-800-835-2830.

Combustion Air Inlet Piping

The Direct Vent system requires the installation of a pipe to supply combustion air from the outdoors directly to the pool heater. The air inlet piping can either be brought in horizontally from a sidewall or vertically from the rooftop. Make sure the combustion air inlet is in the same pressure zone as the vent terminal.

In cold climates, use a Type-B doublewall vent pipe or an insulated single wall pipe for combustion air. This will help prevent moisture in the cool incoming air from condensing and leaking from the inlet pipe.

⚠ CAUTION: **Pool heaters that are shut down or will not operate may experience freezing due to convective airflow in the air inlet pipe.**

Length of Air Inlet Pipe

The installed length of air inlet pipe from the pool heater to the outside air inlet cap must not exceed 50 equivalent feet (15.2m). Subtract 5 feet (1.5m) of equivalent length for each 90° elbow. Subtract 2.5 feet (0.7m) of equivalent length for each 45° elbow.

Do not exceed the limits for the combustion air inlet piping lengths.

Connecting the Air Inlet Pipe to the Pool Heater

Connect the air inlet piping directly to the pool heater by attaching it to the DV box adapter. The DV box adapter is included in the direct vent kits for horizontal direct vent. For vertical direct vent, order the DVK3003 kit from the pool heater manufacturer. The combustion air inlet area of the pool heater is located at the right rear corner of the pool heater. This pool heater uses a simple air filter to ensure clean air is used for the combustion process. Attach the DV box adapter over the air filter (see Figure 24). Align the screw holes on the DV box adapter with the screw holes surrounding the air filter hanger. Insert the sheet metal screws and tighten firmly.

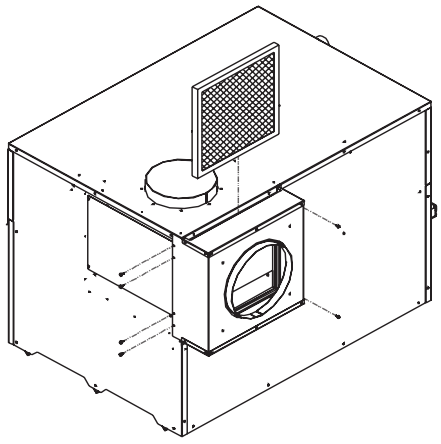


Figure 24 – Attaching DV Box Adapter to Unit

For venting versatility, you can move the air filter assembly and DV box adapter to the right side of the pool heater. Remove the metal panel on the pool heater's right side (see Figure 25). Remove the filter/bracket assembly from the rear of the pool heater.

NOTE: Modifications to the DV box adapter will be necessary to allow installation on the right side of the pool heater. Follow the instructions shipped with the vent kit.

Attach the filter/bracket assembly and DV box adapter to the right side opening using the pre-drilled screw holes. Make sure you attach the metal panel to the rear combustion air opening of the pool heater.

The DV box adapter has an air inlet pipe mounting ring. Connect combustion air inlet piping to the direct vent box mounting ring.

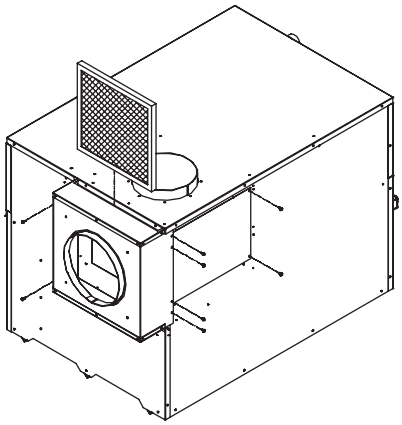


Figure 25 – Moving Air Filter Assembly and DV Box Adapter

Air Inlet Piping Materials

The air inlet pipe(s) must be sealed. Select the air inlet pipe material from the following specified materials.

- Galvanized steel vent pipe with joints and seams sealed as specified below.
- Type-B doublewall vent with joints and seams sealed as specified above.

⚠ WARNING: **Use only vent or air intake materials specified in this manual. Follow vent pipe manufacturer's instructions. Failure to do so can result in property damage, personal injury, or death. Mixing of venting materials will void the warranty and certification of this pool heater.**

Sealing Type-B Doublewall Vent Pipe or Galvanized Vent Pipe

Follow the steps below to properly seal Type-B doublewall vent pipe or galvanized vent pipe.

1. Seal all joints and seams of the air inlet pipe using either

INSTALLATION Continued

aluminum foil duct tape meeting UL Standard 723 or 181 A-P or a high quality UL Listed silicon sealant such as those manufactured by Dow Corning or General Electric.

2. On horizontal runs, do not install vent pipe with seams pointing down. Position vent pipe so that the seams are on the top side of the vent pipe.
3. Secure all joints with a minimum of three sheet metal screws or pop rivets. Apply aluminum foil duct tape or silicone sealant to all screws or rivets installed in the vent pipe.
4. Ensure that the air inlet pipes are properly supported.

⚠ WARNING: **Properly seal all joints and seams in the inlet vent piping system. Failure to do so may result in flue gas recirculation, spillage of flue products, and carbon monoxide emissions. Carbon monoxide poisoning can cause severe personal injury or death.**

Combined Combustion Air Inlet Points

You can combine the air inlet pipes from multiple pool heaters to a single common connection if the common air inlet pipe has a cross sectional area equal to or larger than the total area of all air inlet pipes connected to the common air inlet pipe.

Example: Two 8" (20.3cm) air inlet pipes (50.3 in^2 [324.5cm^2] area each) have a total area of 100.6 in^2 (645.2cm^2), requiring a 12" (30.5cm) (113.1 in^2 [729.7cm^2]) common air inlet pipe.

The air inlet point for multiple pool heater air inlets must be provided with an exterior opening which has a free area equal to or greater than the total area of all air inlet pipes connected to the common air inlet. This exterior opening for combustion air must connect directly to the outdoors. The total length of the combined air inlet pipe must not exceed a maximum of 50 (15.2m) equivalent feet. You must deduct the restriction in area provided by any screens, grills, or louvers installed in the common air inlet openings and some rooftop terminations. Screens, grills, or louvers installed in the common air inlet can reduce the free area of the opening from 25% to 75% based on the materials used.

Vertical and Sidewall Combustion Air Inlet

IMPORTANT: To prevent recirculation of flue products into the combustion air inlet, follow all instructions in this section.

⚠ WARNING: **Locate and install the combustion air inlet termination correctly. Failure to do so can allow the discharge of flue products to be drawn into the combustion process. This can result in incomplete combustion and potentially hazardous levels of carbon monoxide in the flue products. This will cause operational problems and the spillage of flue products. Spillage of flue products can cause personal injury or death due to carbon monoxide poisoning.**

You must locate the combustion air cap and the flue gas outlet on the same rooftop surface (vertical direct vent system) or sidewall surface (horizontal direct vent system) and in the same pressure zone as the vent termination. Follow all clearance requirements listed on pages 8 and 9.

Purchase and assemble the combustion air inlet cap to protect the air inlet from wind and weather.

Alternatively, assemble the combustion air inlet cap for the vertical rooftop air inlet from items purchased locally. The air inlet cap consists of two 90° elbows installed to the air inlet pipe (see Figure 26). Install the first 90° elbow on the rooftop at the highest vertical point of the air inlet pipe. Install the second 90° elbow on the horizontal outlet of the first elbow. The outlet of the second 90° elbow will be pointing down. You may use a 90° elbow and a 90° street elbow to make this assembly. If you use a straight piece of pipe between the two 90° elbows, it should not exceed 6" (51mm) in length.

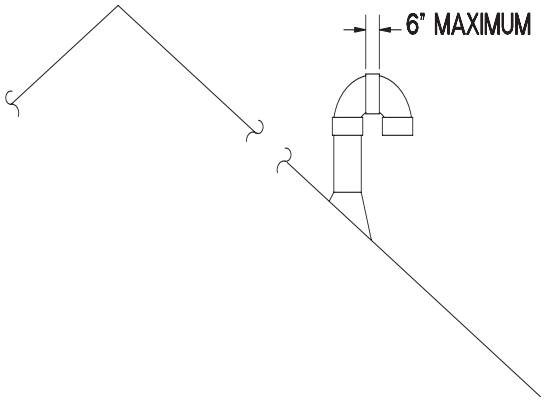


Figure 26 – Vertical Rooftop Air Inlet

For horizontal direct vent termination of combustion air, you must use the termination cap from the pool heater manufacturer. The sidewall air inlet cap is available as part of a direct vent kit. See TABLE–G for Horizontal Direct Vent Kits.

Vertical Combustion Air Inlet Clearances

You must locate the air inlet termination elbow at least 12" (30cm) above the roof or above normal snow levels.

If the air inlet cap is within a 10-foot (3.05m) radius of the flue outlet, the point of termination for the combustion air inlet cap must be at least 3 feet (0.91m) below the point of flue gas termination (vent cap).

Do not install the combustion air inlet cap closer than 10 feet (3.05m) from an inside corner of an L-shaped structure.

Horizontal Combustion Air Inlet Clearances

You must locate the horizontal air inlet termination point at least 12" (30cm) above grade and above normal snow levels.

If the air inlet cap is within a 10-foot (3.05m) radius of the flue outlet, the point of termination for the combustion air inlet cap must be at least 3 feet (0.91m) horizontally and 12 inches (30cm) below the point of flue gas termination (vent cap). Do not install the horizontal combustion air inlet cap above the flue outlet.

Do not install the combustion air inlet cap closer than 10 feet (3.05m) from an inside corner of an L-shaped structure.

Multiple Sidewall Direct Vent Installations

The combustion air inlet caps for multiple pool heater installations must maintain the same minimum clearance from the closest flue vent cap as specified in single pool heater installations. You may install multiple flue outlet caps side-by-side and multiple combustion air inlet caps side-by-side, but the air inlet must always be at least 3 feet (0.91m) horizontally and 12 inches (30cm) below the closest flue outlet. Do not install combustion air inlet caps above the flue outlets.

Maintain all clearances and installation requirements for multiple pool heater installations.

6. Outdoor Installation Venting

IMPORTANT: Before installing a venting system, follow all venting clearances and requirements found in the *Venting, General Information* section, page 10.

These pool heaters are self-venting and can be used outdoors when installed with the optional outdoor cap. This cap mounts directly to the top of the pool heater and covers the flue outlet and combustion air inlet openings. No additional vent piping is required.

⚠ WARNING: Only install outdoor models outdoors and only use the vent cap supplied by the pool heater manufacturer. Personal injury or product damage may result if any other cap is used or if an outdoor model is used indoors. Properly install all covers, doors and jacket panels to ensure proper operation and to prevent a hazardous condition.

Combustion air supply must be free of contaminants (see *Combustion and Ventilation Air*, page 7). To prevent recirculation of the flue products into the combustion air inlet, follow all instructions in this section.

Outdoor Vent/Air Inlet Location

Keep venting areas free of obstructions. Keep area clean and free of combustible and flammable materials. Maintain a minimum clearance of 3" (76mm) to combustible surfaces and a minimum of 3" (76mm) clearance to the air inlet. To avoid a blocked air inlet or blocked flue condition, keep the outdoor cap air inlet, flue outlet and drain slot clear of snow, ice, leaves, debris, etc.

Do not install outdoor models directly on the ground. You must install the outdoor pool heater on a concrete, brick, block, or other non-combustible pad.

Do not locate the pool heater so that high winds can deflect off of adjacent walls, buildings or shrubbery causing recirculation. Recirculation of flue products may cause operational problems, bad combustion or damage to controls. Locate unit at least 3 feet (0.91m) from any wall or vertical surface to prevent wind conditions from affecting performance.

Multiple pool heater outdoor installations require 48" (1.22m) clearance between each vent cap. Locate the outdoor cap at least 48" (1.22m) below and 48" (1.22m) horizontally from any window, door, walkway or gravity air intake.

Locate the pool heater at least 10 feet (3.05m) away from any forced air inlet.

Locate pool heater at least 3 feet (0.91m) outside any overhang.

Clearances around outdoor installations can change with time. Do not allow the growth of trees, shrubs or other plants to obstruct the proper operation of the outdoor vent system.

Do not install in locations where rain from building runoff drains will spill onto the pool heater.

INSTALLATION Continued

TABLE-H Outdoor Vent Cap Kits		
Input Btu/hr	Kit* without Pump Cover	Kit* with Pump Cover
500,000	ODK3748	ODK3052
650,000	ODK3749	ODK3053
750,000	ODK3749	ODK3053
990,000	ODK3036	ODK3049
1,260,000	ODK3037	ODK3050
1,440,000	ODK3037	ODK3050
1,800,000	ODK3038	ODK3051
2,070,000	ODK3038	ODK3051

* These kits include an outdoor vent cap and gasket.

Flue gas condensate can freeze on exterior walls or on the vent cap. Frozen condensate on the vent cap can result in a blocked flue condition. Some discoloration to exterior building or pool heater surfaces can be expected. Adjacent brick or masonry surfaces should be protected with a rust resistant sheet metal plate.

The Outdoor Vent Cap Kit

The optional outdoor vent cap kit is available from the pool heater manufacturer. The outdoor cap part numbers are listed by input size. See TABLE–H for kit numbers.

You can install the outdoor vent cap on either the back or right side of the pool heater (see Figures 27 and 28). Complete installation instructions are included with the outdoor vent cap kit.

The air filter bracket will need to be rotated as shown in Figures 27 and 28 to allow proper access to the filters with the outdoor vent cap in place.

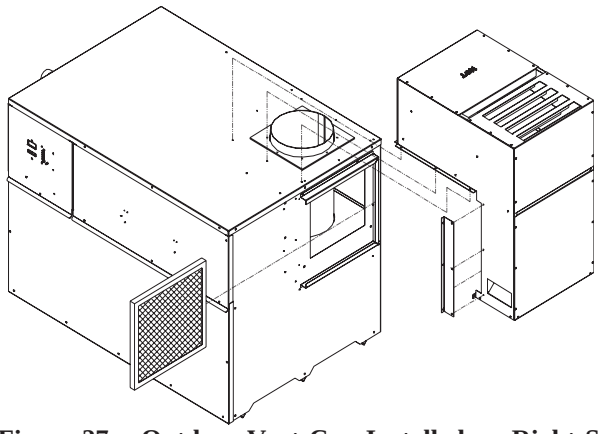


Figure 27 – Outdoor Vent Cap Installed on Right Side of Pool Heater

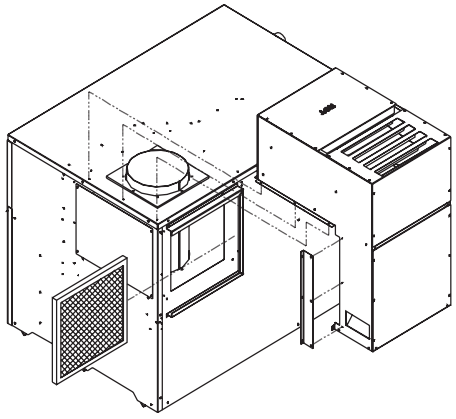


Figure 28 – Outdoor Vent Cap Installed on Rear of Pool Heater

CONNECTING TO GAS SUPPLY

Only supply gas type specified on the pool heater's rating plate. This pool heater is orificed for operation up to 2000 feet altitude. If installing above 2000 feet elevation, consult the pool heater manufacturer.

INLET PRESSURE: Measure inlet pressure at the inlet pressure tap located upstream of the combination gas valve(s).

See TABLE–I for maximum and minimum inlet pressures. Do not exceed the maximum. Minimum inlet pressure is for the purposes of input adjustment.

TABLE-I Inlet Pressure		
	Max.	Min.
Nat. Gas	10.5" w.c.	4.5" w.c.
LP Gas	13" w.c.	8" w.c.

MANIFOLD PRESSURE: Measure manifold pressure at the pressure tap on the downstream side of the combination gas valves. The gas regulator on the pool heater's combination gas valves is preset at the factory to supply proper manifold pressure for normal operation. See TABLE–L for net manifold pressure settings.

If you must adjust regulator pressure, follow the instructions under *Gas Manifold Pressure Adjustment*, page 30. Do not increase regulator pressure beyond specified pressure setting.

Gas Pressure Test

1. Disconnect the unit from the gas supply piping system during any piping system pressure testing greater than 1/2 PSIG (3.5kPa).

2. Isolate the pool heater from the gas supply piping system by closing a manual shutoff valve during any piping system pressure testing that is equal to or less than 1/2 PSIG (3.5kPa).
3. Test all gas connections for gas leaks before placing the pool heater in operation.

Gas Piping

To safely operate this pool heater, you must properly size the gas supply piping. See Tables- J and K for piping and fitting requirements. Gas pipe size may be larger than pool heater connection.

The gas connection to these pool heaters is 2" NPT.

IMPORTANT: Do not block access to the electrical cover plate when installing the sediment trap. The sediment trap must be a minimum of 12 inches from the pool heater.

Optional gas controls may require routing of bleeds and vents to the atmosphere, outside the building when required by local codes.

Connecting Gas Piping to the Pool Heater

All gas connections must be made with pipe joint compound resistant to the action of liquefied petroleum (L.P.) and natural gases. All piping must comply with local codes and ordinances. Piping installations must comply with approved standards and practices.

1. Make sure the gas line is a separate line direct from the meter unless the existing gas line is of sufficient capacity. Verify pipe size with your gas supplier.

2. Use new, properly threaded black iron pipe free from chips. If you use tubing, make sure the ends are cut square, deburred and clean. Make all tubing bends smooth and without deformation. Avoid flexible gas connections. Internal diameter of flexible lines may not provide the pool heater with the proper volume of gas.

3. For ease of service, install a union.

4. Install a manual main gas shutoff valve at the pool heater's gas inlet, outside of the pool heater in accordance with the National Fuel Gas Code, ANSI Z223.1, this must be installed within 6 feet of the pool heater.

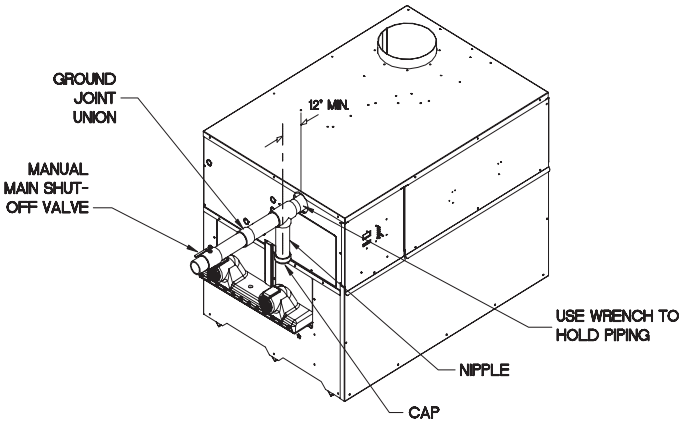


Figure 29 – Gas Line Connection

5. Run pipe or tubing to the pool heater's gas inlet. If you use tubing, obtain a tube to pipe coupling to connect the tubing to the pool heater's gas inlet.

6. Install a sediment trap in the supply line to the pool heater's gas inlet (see Figure 29).

7. Apply a moderate amount of good quality pipe compound (do not use Teflon tape) to pipe only, leaving two end threads bare.

8. Remove the seal over the gas inlet to the pool heater.

9. Connect the gas pipe to the inlet of the pool heater. Use a wrench to support the gas manifold on the pool heater.

10. For L.P. gas, consult your L.P. gas supplier for expert installation.

11. Ensure that all air is completely bled from the gas line before starting the ignition sequence. Start up without properly bleeding air from the gas line may require multiple reset functions of the ignition control module to achieve proper ignition.

⚠ WARNING**: Do not have any open flame in proximity to the gas line when bleeding air from the gas line. Gas may be present.**

Gas Train and Controls

NOTE*:* The gas train and controls assembly provided on this pool heater have been tested under the applicable American National Standard to meet minimum safety and performance criteria such as safe lighting, combustion and safety shutdown operation.

INSTALLATION Continued

Figure 30 shows a typical pool heater gas train.

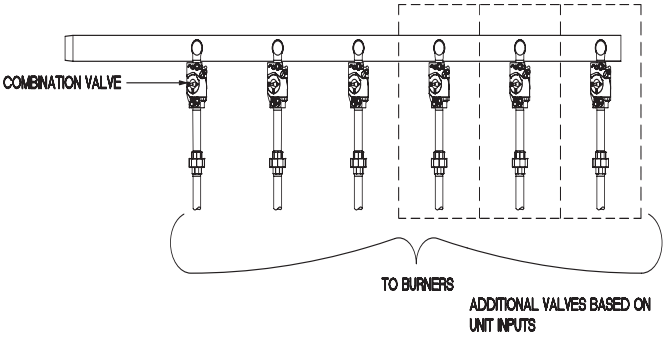


Figure 30 – Typical Pool Heater Gas Train Drawing

TABLE-J
Suggested Gas Pipe Size for Single Unit Installations

Btu/hr	Distance From Meter (in feet)				
Input	0-50	51-100	101-200	201-300	301-500
500,000	1 1/4"	1 1/2"	2"	2"	2 1/2"
650,000	1 1/2"	2"	2"	2 1/2"	2 1/2"
750,000	1 1/2"	2"	2"	2 1/2"	3"
990,000	2"	2"	2 1/2"	2 1/2"	3"
1,260,000	2"	2 1/2"	2 1/2"	3"	3"
1,440,000	2 1/2"	2 1/2"	3"	3"	3 1/2"
1,800,000	2 1/2"	3"	3"	3 1/2"	3 1/2"
2,070,000	2 1/2"	3"	3"	3 1/2"	4"

Combination Gas Valves

These pool heaters fire in a single stage of operation.

NOTE: This pool heater incorporates a "soft start" feature which lights approximately half of the burners before lighting the remaining burners. Each combination valve consists of a gas regulator and two valve seats to meet the requirements for redundant gas valves. The valve has a gas control knob that must remain in the open position at all times when the pool heater is in service. The gas control valve has pressure taps located on the inlet and discharge sides of the valve. Manifold pressure is adjusted using the regulator located on the valve. A manifold gas pressure tap for each burner stick is located on the discharge side of the valve.

The manifold pressure is preset at the factory and adjustment is not usually required. If you must adjust regulator pressure, follow the instructions under *Gas Manifold Pressure Adjustment*, page 30.

Venting of Combination Gas Valves

The combination gas valve/regulator used on these pool heaters is equipped with an integral vent limiting orifice per ANSI Z21.78. The vent limiter ensures that the volume of gas emitted from the valve in the event of a failed gas diaphragm does not exceed the maximum safe leakage rate allowed by agency requirements. Combination gas valve/regulators equipped with integral vent limiters are not required to have vent or relief lines piped to the outdoors.

Checking Gas Supply Pressure

Use the following procedure to check gas supply pressure.

1. Turn the main power switch to the "OFF" position.
2. Turn gas valve knobs to the "OFF" position.
3. Shut off gas supply at the field-installed manual gas cock in the gas piping to the pool heater. If fuel supply is L.P. gas, shut off gas supply at the tank.
4. Remove the 1/8" hex plug, located on the "inlet" side of any gas valve. You may also use a tapping on the field-installed main manual gas cock or gas piping. Install a fitting in the inlet pressure tapping suitable to connect to a manometer or magnahelic gauge. Range of scale should be 14" w.c. or greater to check inlet pressure.
5. Turn on gas supply at the manual gas cock, turn on L.P. gas at the tank if required.
6. Turn the power switch to the "ON" position.
7. Turn the gas valve knobs to the "ON" position. Set the temperature control to call for heat. See *Operating Temperature Control* on page 37 for programming instructions.
8. Observe the gas supply pressure as all burners are firing. Ensure that inlet pressure is within the specified range. See *Connecting To Gas Supply*, page 26 for minimum and maximum gas supply pressures.
9. If gas pressure is out of range, contact gas utility, gas supplier, qualified installer or service agency to determine necessary steps to provide proper gas pressure to the pool heater.
10. If gas supply pressure is within normal range, turn the power switch to the "OFF" position.
11. Turn gas valve knobs to the "OFF" position.
12. Shut off gas supply at the manual gas cock in the gas piping to the pool heater. If fuel supply is L.P. gas, shut off gas supply at the tank.

13. Remove the manometer and related fitting from the “inlet” side of the gas valve, replace 1/8" hex plug in the gas valve and tighten.
14. Turn on the gas supply at the manual valve, turn on L.P. gas at the tank if required.
15. Turn the power switch to the “ON” position.
16. Turn the gas valve knobs to the “ON” position.
17. Set the temperature control to call for heat.

> ⚠ WARNING: **After completing any testing on the gas system, leak test all gas connections. Apply a soap/water solution to all gas connections while main burners are operating. Bubbles forming indicate a leak. Repair all leaks at once. Do not operate this pool heater with a leak in the gas train, valves or related piping.**

Check burner performance by cycling the system while you observe burner response. Burners should ignite promptly. Flame pattern should be stable, see *Burner Flames*, page 45. Turn system off and allow burners to cool, then cycle burners again to ensure proper ignition and flame characteristics.

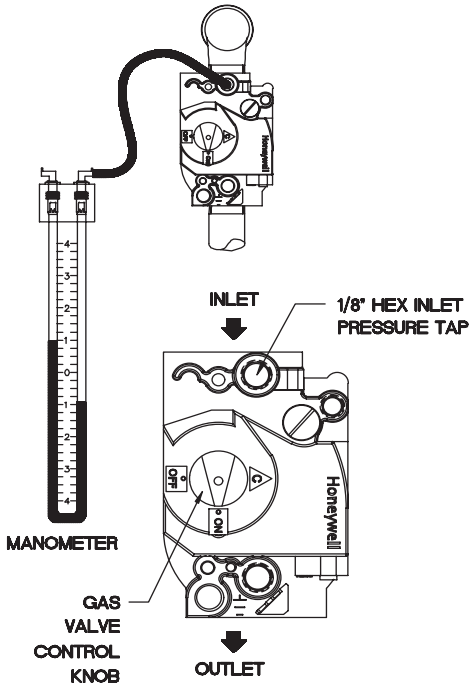


Figure 31 – Measuring Gas Supply Pressure at Combination Gas Valve

TABLE - K
Multiple Unit Installations Gas Supply Pipe Sizing

Nominal Iron Pipe Size, (Inches)	Length of Pipe In Straight Feet													
	10	20	30	40	50	60	70	80	90	100	125	150	175	200
3/4"	369	256	205	174	155	141	128	121	113	106	95	86	79	74
1"	697	477	384	328	292	267	246	256	210	200	179	164	149	138
1 1/4"	1,400	974	789	677	595	543	502	472	441	410	369	333	308	287
1 1/2"	2,150	1,500	1,210	1,020	923	830	769	707	666	636	564	513	472	441
2"	4,100	2,820	2,260	1,950	1,720	1,560	1,440	1,330	1,250	1,180	1,100	974	871	820
2-1/2"	6,460	4,460	3,610	3,100	2,720	2,460	2,310	2,100	2,000	1,900	1,700	1,540	1,400	1,300
3"	11,200	7,900	6,400	5,400	4,870	4,410	4,000	3,800	3,540	3,300	3,000	2,720	2,500	2,340
4"	23,500	16,100	13,100	11,100	10,000	9,000	8,300	7,690	7,380	6,870	6,150	5,640	5,130	4,720

Maximum capacity of pipe in thousands of BTU’s per hour for gas pressures of 14 Inches Water Column (0.5 PSIG) or less and a total system pressure drop of 0.5 Inch Water Column (Based on NAT GAS, 1025 BTU’s per Cubic Foot of Gas and 0.60 Specific Gravity).

Gas Manifold Pressure Adjustment

IMPORTANT: The gas valves are referenced to the fan pressurized chamber by a hose connected from the vent of the gas valve regulator to the chamber pressure tap located on the front inside portion of the jacket. Reference the drawings in this section for component and connection points for pressure measurement. The procedure for connecting a manometer or magnahelic must be followed to obtain actual net manifold pressure for normal operation. A manometer or magnahelic gauge legible in 0.1" increments up to 10 inches w.c. is required to check and adjust the manifold pressure. The regulator cover screw on the gas valve must be in place and tight at all times for the pool heater to operate properly.

1. Remove the thumbscrew that fastens the control panel access door and pull out the control panel.
2. Turn the power switch located in the lower left corner behind the control panel access door to the “O” or “OFF” position.
3. Remove the top front jacket access panels to access the gas valves.
4. Locate the reference hose on the second gas valve which goes from the vent fitting on the gas valve to a barbed fitting on the deck of the pool heater (see Figure 32).
5. Remove the flexible cap from the barbed fitting on the “tee” located in this line and hook one side of the manometer, or (-) side of a magnahelic gauge, to this “tee”. Retain this cap for future use.

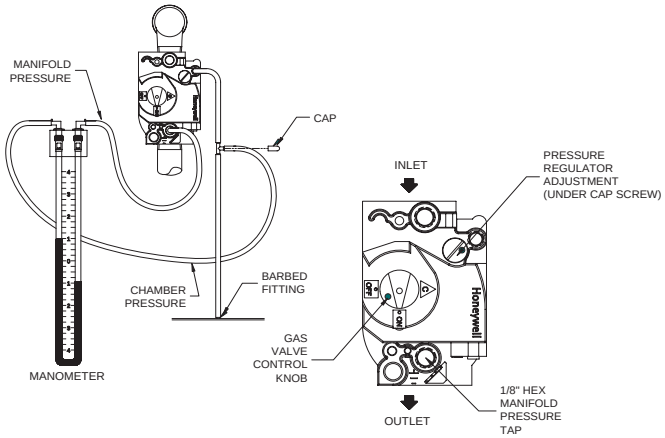


Figure 32 – Measuring Net Manifold Gas Pressure

6. Remove the 1/8" hex plug from the manifold pressure tap on the gas valve (see Figure 32). Retain plug for future use.
7. Install a fitting in this tap that is suitable for connection of a hose to a manometer, or (+) side of a magnahelic gauge (see Figure 32).
8. Turn the power switch to the “I” or “ON” position.
9. Push the reset button(s) for the ignition control(s), if necessary.
10. Set the temperature control to call for heat (see Programming Temperature Control).
11. Once the pool heater is firing the manometer/magnahelic will reflect the Manifold Gas Pressure. Compare this reading to the respective value in TABLE-L for Natural Gas or Propane Gas.
12. If adjustment is necessary, remove the regulator cover screw on the gas valve.

NOTE: If the gas valve under adjustment is located on a manifold assembly monitored by an igniter, the pool heater may shut down and recycle when the regulator cover screw is removed. This is normal.

13. Turn the regulator adjustment screw “clockwise” ↱ to raise the regulator gas pressure. Turn the regulator adjustment screw “counterclockwise” ↰ to lower the regulator gas pressure.
14. Replace the regulator cover screw and make sure it is tight for proper operation.
15. Read the value on the manometer/magnahelic and compare it to the values in TABLE-L.
16. Repeat this adjustment procedure for each gas valve as necessary to adjust to the proper manifold gas pressure.
17. Remove hoses, replace and tighten plugs and caps when complete.
18. Replace top front upper jacket access panels and control panel door in reverse order.
19. If proper ignition and burner operation is not achieved after checking gas supply pressure, see *Cleaning and Maintenance*, page 46 for Combustion Air Fan Adjustment. Follow the procedure to adjust the combustion air fans as necessary.

TABLE-L Net Manifold Pressure	
500,000 - 750,000	
Nat. Gas	1.8" w.c.
LP Gas	4.6" w.c.
990,000 - 2,070,000	
Nat. Gas	1.2" w.c.
LP Gas	4.6" w.c.

* Net Manifold Pressure equals the measured manifold pressure minus the chamber pressure. See Figure 32 to measure the Net Manifold Pressure.

POOL HEATER PIPING INSTALLATION

Install piping from the filter system to the pool heater as shown in the pool heater piping diagrams. See Figures 33 and 34. Minimum pipe diameter to and from the installed pool heater to the filter system piping is 2-1/2". A valve should be installed in the filter system piping between the supply and return piping connections for the pool heater. This valve can be partially closed to divert a portion of the filter system flow to the pool heater so it can be heated, added to the filter system piping and returned to the pool. The piping from the filter system to the pool heater may be PVC, CPVC or Copper Pipe. The piping from the pool heater back to the filter system will carry water with temperatures in excess of 110°F and must be CPVC or Copper Pipe. The temperature of the heated water from the pool heater will be substantially cooled as it is mixed back into the pool water from the filter system and returned to the pool. The mix of heated water and pool water from the filtration system should only be slightly warmer than the pool water before the connections from the pool heater.

Auxiliary Mixed Water Limit Control

Ensure that the auxiliary 110°F mixed water limit control supplied with the pool heater is installed in the filter system piping a minimum of three feet downstream from the point where the heated water from the pool heater is added to the filtration system piping. The limit may be mounted in a 3/8" NPT tapped fitting installed in the filtration system piping or it may be installed directly into a tapped opening in the PVC filter system piping. Turn off the filter system pump when installing the auxiliary limit in the filtration system piping. A tapped opening can be added to the PVC pipe by first drilling a 9/16" pilot hole in the PVC pipe at least three feet downstream of the point where the heated water from the pool heater is added to the filter piping. The drilled pilot hole can now be carefully threaded with a 3/8" NPT taper tap. After the pipe threads have been cut into the PVC pipe wall, the limit can be inserted into the tapped opening. Apply a small amount of a high quality RTV silicone sealant to the threads on the limit to prevent leaks and install the limit into the threaded opening in the pipe. Install the limit control and tighten to seal. Do not over tighten the brass limit into the threaded opening in the PVC pipe. Over tightening the limit can damage the limit and/or strip the threads cut into the plastic pipe. Wire the limit into the pool heater control circuit as shown in the wiring diagram for your model. If additional wire length is needed, use 18 GA wire for distances up to 30 ft. For longer distances, size the wire per Table N. Use weatherproof connections for outdoor installation.

This is a high efficiency pool heater which requires a special pumped bypass for proper operation. This bypass assembly and the required pump are pre-installed on the pool heater as shipped from the factory. All piping to connect to the filter system to the pool heater is made directly to the bypass piping on the pool heater. The pump supplied on the pool heater bypass has a sealed motor suitable for outdoor installations. All electrical wiring to the pump must comply with local code requirements.

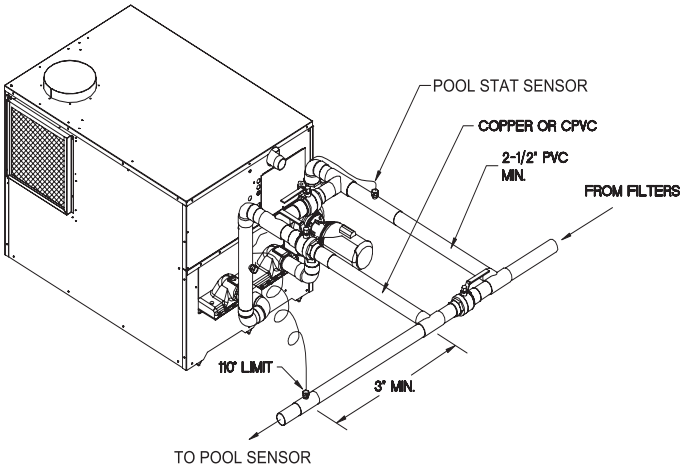


Figure 33 - Pool Heater Piping Diagram

INSTALLATION Continued

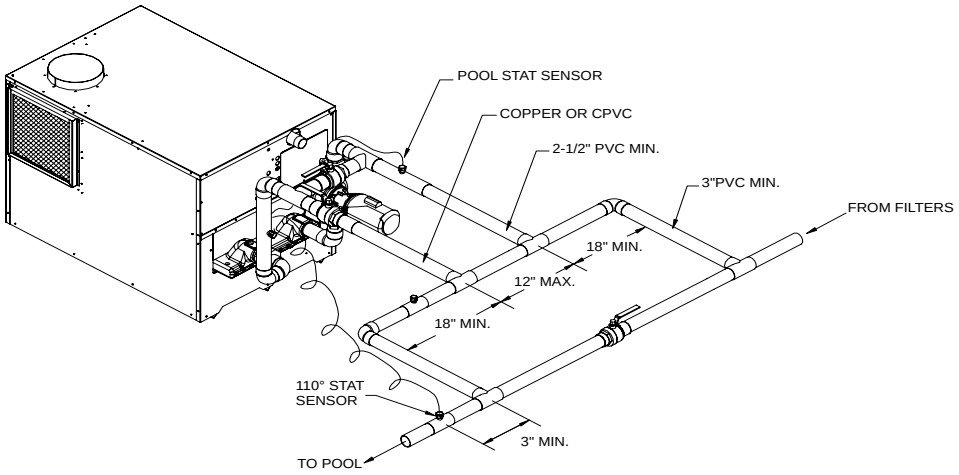


Figure 34 – Pool Heater Piping Diagram

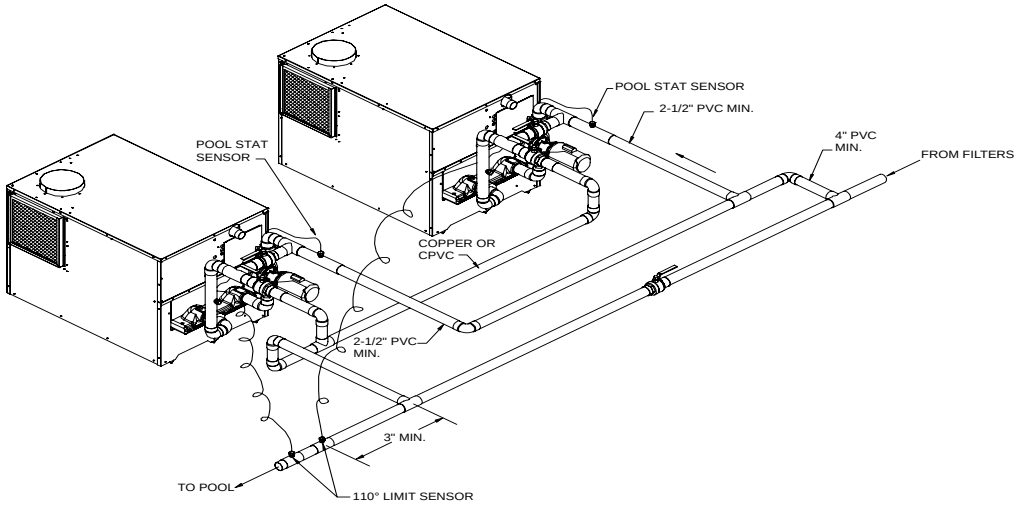


Figure 35 - Typical Pool Heater Piping Detail for Multiple Units with Less than 40' Piping for Each Pool Heater

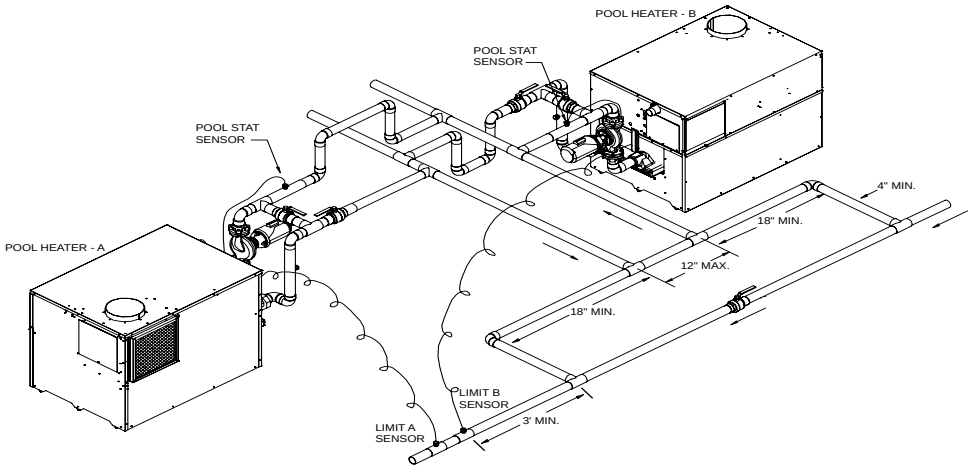


Figure 36 - Typical Pool Heater Piping Detail for Multiple Units with More than 40' Piping for each Pool Heater

Relief Valve

This pool heater is supplied with a relief valve(s) sized in accordance with ASME Boiler and Pressure Vessel Code, Section IV. The relief valve(s) is installed in the vertical position and mounted in the hot water outlet. Place no other valve between the relief valve and the pool heater. To prevent water damage, pipe the discharge from the relief valve to a suitable floor drain for disposal when relief occurs. Do not install any reducing couplings or other restrictions in the discharge line. The discharge line will allow complete drainage of the valve and line. Manually operate the relief valves at least once a year.

⚠ CAUTION: **Avoid contact with hot discharge water.**

Automatic Chlorinator and Chemical Feeders

All chemicals must be diluted into the pool water being circulated through the pool heater. Any concentration of chlorine in the pool heater can cause damage to the pool heater. Do not place chlorine tablets or bromine sticks in the skimmer. High chemical concentrations will result when the pump is not running.

Chlorinator must feed downstream of the pool heater and have an anti-siphoning device to prevent chemical back-up in the pool heater when the pump is shut off.

IMPORTANT: High chemical concentrations from improperly adjusted feeders and Chlorinator can cause rapid corrosion to the heat exchanger. This damage is non-warrantable.

Water Flow Switch

A water flow switch is available as a factory option. The flow switch is wired in series with the factory installed water pressure switch. This wiring connection installs the flow switch in the 24 VAC safety circuit to prove water flow before main burner ignition. The factory option flow switch is installed in the outlet side of the piping loop when shipped from the factory. These pool heaters require a minimum flow of 26 GPM to make the flow switch and start burner operation. Ensure that the pump installed on the pool heater will supply adequate flow to make the flow switch contacts and operate the pool heater. A water flow switch meets most code requirements for a low-water cut off device on appliances requiring forced circulation for operation.

Pump Purge Delay Option

An electronic pump purge option is available for this pool heater. During extended periods of inactivity during which pumping may have been turned off to conserve energy, air can become entrapped in the piping. The pump purge option delays pool heater operation until the pump has been on for sufficient time to remove air from piping. Both the inactivity time and pump purging time are adjustable.

The inactive timer is adjustable from 1 - 99 hours. Selection of a time between 4 - 8 hours is recommended.

The purge timer is adjustable from 1 - 60 minutes. Selection of a time between 10 to 30 minutes is recommended.

When provided, the pump purge circuitry also controls the pump post purge time. Pump post purge allows the pump to run for a brief period of time after a call for heat in order to remove any residual heat from the heat exchanger. The post purge timing is adjustable from 1 - 100 seconds. Selection of 60 seconds is recommended.

An override toggle switch is provided to turn off the pump purge feature for testing or should the option no longer be desired. When turned off, the call for heat will not be delayed.

NOTE: The pump post purge feature will continue to function in the Override Mode.

Service Indicator Option

A service indicator option is available for this pool heater. When 500 hours of operation have occurred, the Service Indicator light on the Diagnostic Information Panel will light up indicating service should be conducted. Contact a qualified serviceperson to perform service on the pool heater.

CONNECTING TO ELECTRICAL SUPPLY

This pool heater is wired for 120 VAC service. The pool heater, when installed, must be electrically grounded in accordance with the requirements of the authority having jurisdiction or in the absence of such requirements, with the latest edition of the National Electrical Code ANSI/NFPA No. 70. When the pool heater is installed in Canada, it must conform to the CAE C22.1, Canadian Electrical Code, Part 1 and/or local Electrical Codes.

1. Use only Type-T wire [63°F (35°C) rise] on all wiring between the pool heater and field-installed devices.
2. Enclose line voltage wire exterior to the pool heater in approved conduit or approved metal-clad cable.

INSTALLATION Continued

3. The pump must run continuously when the pool heater is being fired.
4. To avoid serious damage, do not energize the pool heater until the system is filled with water.
5. Provide the pool heater with the proper overload protection.

IMPORTANT: Do not block access to the electrical cover plate when installing electrical conduit.

Refer to *Circulating Pump* on page 43 for information relating to pump wiring.

TABLE-M
AMP Draw Data

Btu/Hr Input	Controls	Fans	Approximate Total Amps
500,000	3.6	2.7	6.3
650,000	5.4	3.4	8.8
750,000	5.4	3.4	8.8
990,000	7.3	3.2	10.5
1,260,000	7.3	3.2	10.5
1,440,000	7.3	6.7	14.0
1,800,000	7.3	6.7	14.0
2,070,000	7.3	6.7	14.0

Temperature Gauge

This pool heater is equipped with two dial type temperature gauges. These gauges are factory installed in the inlet and outlet sides of the heat exchanger. The gauges read water temperature in °F. These are provided to allow set-up and checking of the temperature rise across the heat exchanger.

TABLE-N
Remote Wire Connection

Wire Gauge	Maximum Allowable Length
12 GA	100 ft
14 GA	75 ft
16 GA	50 ft
18 GA	30 ft

Terminal Strip Connection Options

The scenarios shown in Figure 38 represent typical terminal strip connection requirements. The terminal strips are located on the left side of the pool heater under the electrical access panel. Other applications may be accommodated, but must be addressed individually.

Figure 38-A shows the position of the jumpers as shipped from the factory for stand-alone operation of the pool heater.

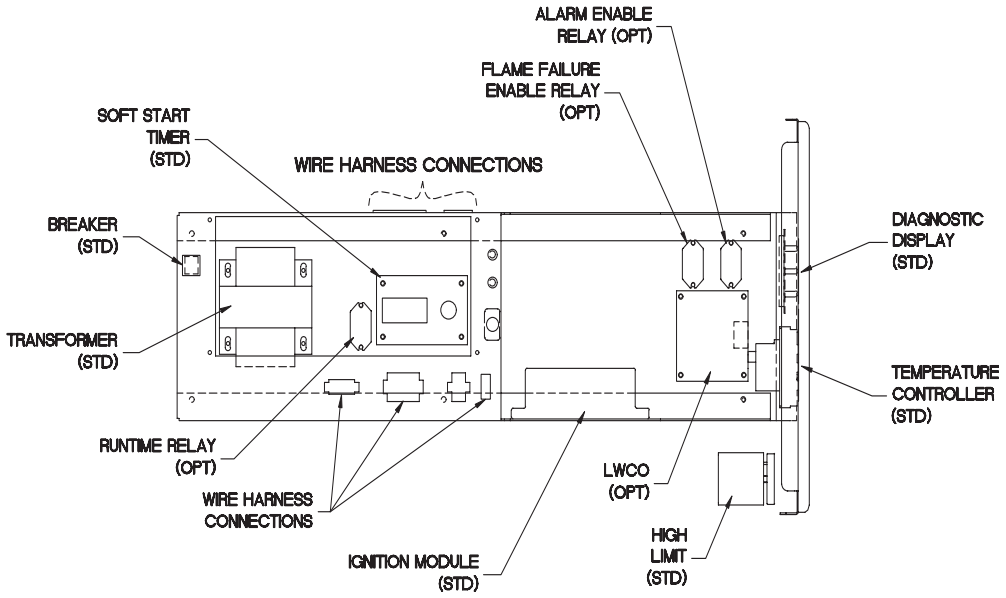
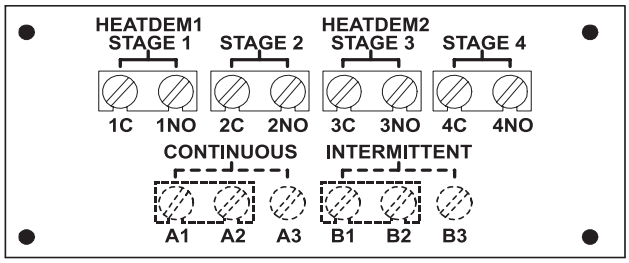


Figure 37 - Control Panel Component Location Drawing

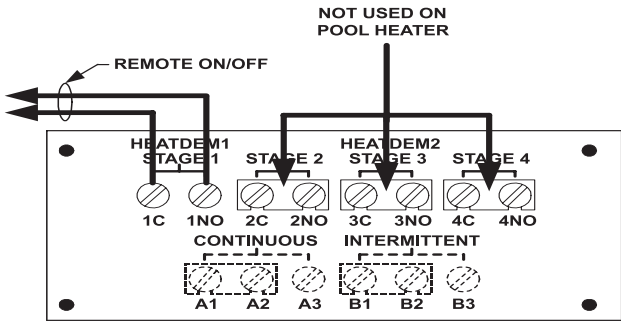
Figure 38-B shows connections to the terminal strip for Remote ON/OFF control of the pool heater. The 1C-1NO jumper must be removed when making these wiring connections. This remote ON/OFF control will provide an Enable/Disable signal to the pool heater and allow the pool heater to operate based on the set point, until the remote ON/OFF signal is cancelled.

Figure 38-C shows the Continuous and Intermittent terminals. External safety devices connected to these terminals will function to protect the pool heater. Devices connected to the Intermittent terminals (B1 and B2) are monitored only when there is an active Call for Heat. Devices connected to the Continuous terminals (A1 and A2) are monitored continuously and will activate and alarm (if the pool heater is equipped with the alarm option) **anytime** the safety device senses an abnormal condition. An additional wire may be field installed from these safety devices to terminals A3 or B3 (as appropriate) to activate an audible alarm (if the pool heater is equipped with the alarm option).

A.



B.



C.

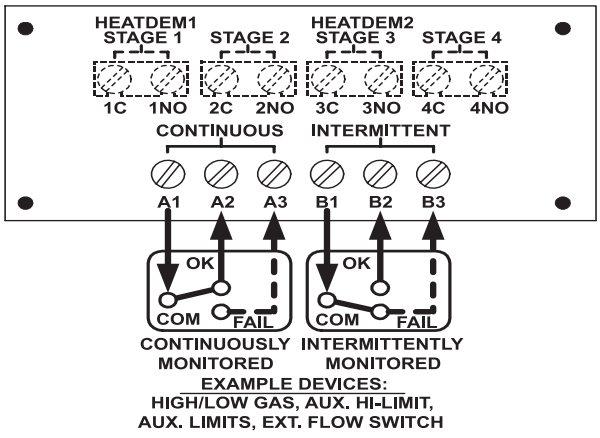


Figure 38 (A-C) - Terminal Strip Connection

OPERATION

FOR YOUR SAFETY READ BEFORE OPERATING

> ⚠ WARNING: **If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury or loss of life.**

A. This pool heater does not have a pilot. It is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.

B. BEFORE OPERATING, smell around the pool heater area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle to the floor.

WHAT TO DO IF YOU SMELL GAS

- **Do not try to light any appliance.**
- **Do not touch any electric switch; do not use any phone in your building.**
- **Immediately call your gas supplier from a neighbor's phone.**
- **Follow the gas supplier's instructions.**
- **If you cannot reach your gas supplier, call the fire department.**

C. Use only your hand to turn the gas control lever. Never use tools. If the lever will not turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.

D. Do not use this pool heater if any part has been under water. Immediately call a qualified service technician to replace the pool heater. The possible damage to a flooded pool heater can be extensive and present numerous safety hazards. Any appliance that has been under water must be replaced.

INSTALLATION Continued

Lighting Instructions

1. STOP! Read the safety information.
2. Program the temperature control to the desired settings (see *Operating Temperature Control*, page 37).
3. Loosen knurled screw at the bottom of control panel cover (see Figure 39).
4. Grasp the bottom of the control panel cover and pull out.
5. Locate the ON/OFF switch inside control area. Switch is located to the left of the pull out control circuitry tray (see Figure 40).
6. Turn the power switch to the "OFF" position.
7. This pool heater is equipped with an ignition device which automatically lights the burners. Do not try to light the burners by hand.

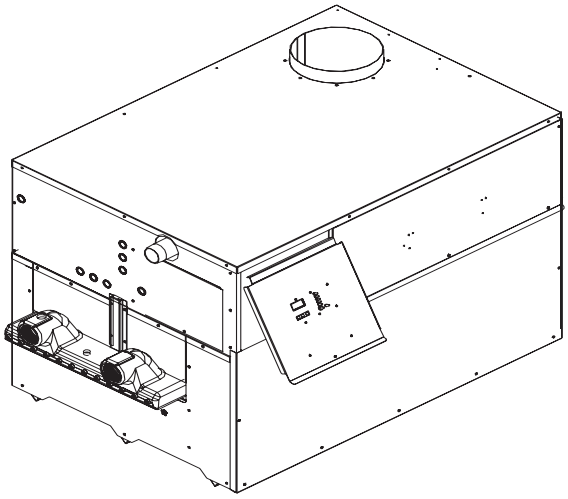


Figure 39 – Control Panel Cover

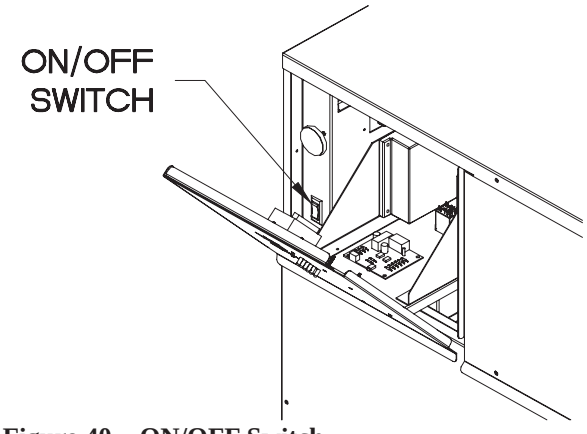


Figure 40 – ON/OFF Switch

8. Turn the manual gas cock clockwise ↱ to the "OFF" position.
9. Wait five (5) minutes to clear out any gas. If you smell gas, STOP! Follow "B" in the safety information. If you don't smell gas, go on to the next step.
10. Turn the manual gas cock counterclockwise ↰ to the "ON" position.
11. Turn the power switch to the "ON" position.
12. Slide the control panel assembly back into the pool heater. Tighten the knurled screw at the bottom of the control panel cover.
13. If the pool heater will not operate, follow the instructions "To Turn Off Gas To Appliance" and call your service technician or gas supplier.

To Turn Off Gas To Pool Heater

1. Open the front access panel to access the control panel.
2. Turn the power switch to the "OFF" position.
3. Turn the manual gas cock clockwise ↱ to the "OFF" position.

> ⚠ WARNING: **Should overheating occur or the gas fail to shut off, turn off the manual gas control valve to the pool heater.**

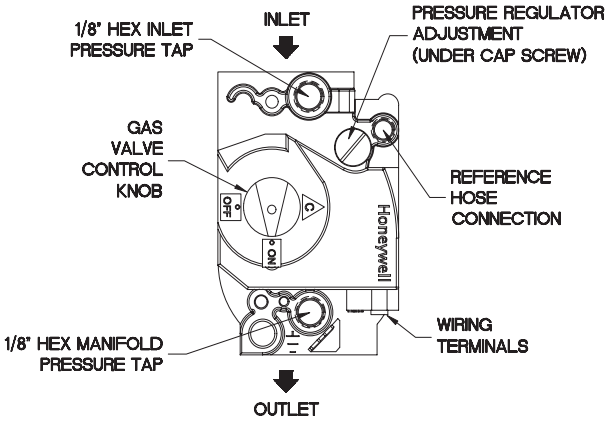


Figure 41 – Combination Gas Valve

Pre-Start Checklist

Before attempting to start the pool heater verify that the following items have been checked:

1. Verify proper location and installation of the pool heater.
2. Check gas piping and ensure the gas line is purged of all air.
3. Ensure that the pool is properly filled.
4. DO NOT operate pool heater if improperly filled.
5. Check to ensure that all water connections are tight.
6. Relief valve has been piped to a suitable floor drain.
7. Combustion air openings are not obstructed in any way.

Starting the Filter System

Verify proper installation of the pool heater temperature controls and the installation of the 110°F auxiliary limit in the mixed discharge water from the filter piping to the pool. Clean the filter. Start the filter pump. Be sure all air is out of all the lines including the pressure connection. Ensure that the pool heater is not "air bound" by manually opening the temperature and pressure relief valve. Leave the valve open until a steady flow of water is observed at the discharge from the valve. Close the valve and complete filling the system.

Ensure that a manual bypass valve is installed in the filter system and installed between the pipe connection supplying the water to the pool heater and the return from the pool heater to the filter system. Adjustment of this valve will divert a portion of the water flow from the filter system to the pool heater for heating.

NOTE: Backwash the filter when the G.P.M. filtration rates are too low to meet local codes or state code. A high temperature rise across the pool heater is also an indication of low flow in the filter system. Sustained low flow to the pool heater will result in cycling of the heater on the limit controls and possible opening of the relief valve.

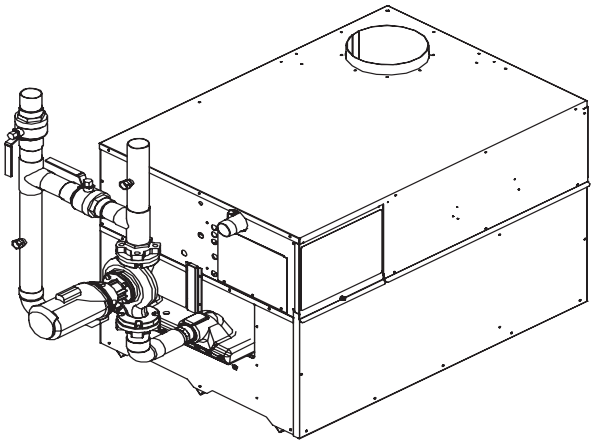


Figure 42 – Vertical Pool Heater Piping

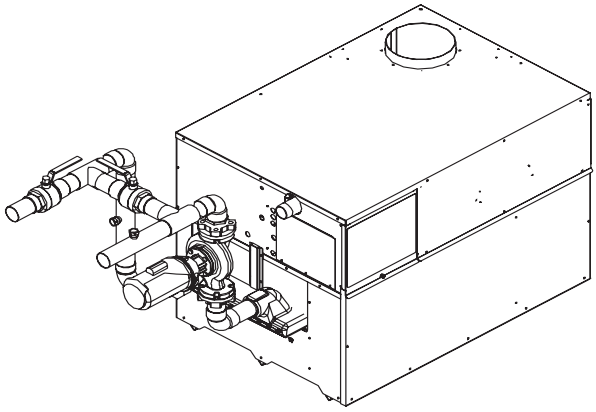


Figure 43 – Horizontal Pool Heater Piping

OPERATING TEMPERATURE CONTROL

The pool heater is equipped with a microprocessor based adjustable digital temperature control to provide ON/OFF operation. Operation is based on temperature input from an immersion sensor. The immersion temperature sensor senses inlet water temperature to the pool heater and is factory installed in a bulbwell in the inlet piping to the pool heater, upstream of the bypass. See Figures 42 and 43. The digital control allows two temperature set points to be programmed into the control, one for normal pool operation (Pool 1) and one for special pool operation (Pool 2). The sensor is a negative coefficient platinum thermistor. A liquid crystal display is provided to indicate sensed temperature and operating parameters.

A differential setting may be applied to each of the pool temperature settings. Once entering the programming mode (see *Programming Mode* on page 38), pressing the **Select** key once will move the cursor on the display to the middle and a separate cursor will display under Pool 1 and Pool 2. The cursor will be flashing in the middle and a separate cursor will display under Pool 1. This indicates that the value shown is for the differential for the Pool 1 setting. Pressing the **Up** or **Down** keys will change this value for the Pool 1 differential setting. Pressing the **Select** key two more times will move the cursor under Pool 2 and a separate flashing cursor in the middle. This indicates that the value shown is for the Pool 2 differential setting. Pressing the **Up** or **Down** keys will change this value for the Pool 2 differential setting. Once all changes have been made, 10 seconds of inactivity will cause the control to exit programming mode.

OPERATION Continued

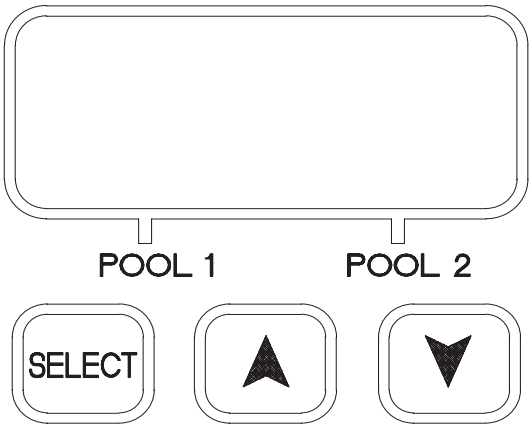


Figure 44 - Temperature Control Display and Programming Keys

Specifications

- Set Point Adjustment Range: 55°F up to 105°F (13°C up to 41°C).
- Differential Adjustment Range: 1°F up to 20°F (1°C-11°C)
- Temperature Accuracy: +/- 1°F.
- Display Resolution: 1°F via Liquid Crystal Display (LCD).
- Sensor: NTC Thermistor, 10k ohms @ 77°F (25°C).
- Operating Humidity: < 90% RH Non-condensing.
- Operating Ambient Temperature: -20° to 140°F (-30° to 60°C).

The temperature control is located behind the overlay on the pool heater. Three programming keys are provided to adjust the temperature set points and differential values and to control the display. The three keys are: the **Select** key, **Up** arrow key and **Down** arrow key.

Select Key - Allows the user to select the currently displayed temperature set point used for operation of the pool heater. Pool temperature settings or OFF may be selected by depressing the **Select** key in normal operation. A pointer will move in the display window to indicate the temperature mode selected for operation. When the "OFF" position is selected, this will disable the call for heat operation of the pool heater. When in the view mode for normal operation, the display shows the current inlet water temperature.

Up and Down Arrow Keys - Allows the displayed parameter to be increased or decreased. After pressing the **Select** key, a control value can be changed by using the arrow keys. Control values will be increased or decreased by 1°F for each time the arrow keys are depressed. The temperature set point for the pool temperature settings may be adjusted at any time by pushing the **Up** or **Down** arrow keys. Ten seconds after any activity to adjust a set point has stopped, the display will revert to showing the current inlet water temperature.

Control values and operation selection will remain in the device memory even after power is removed.

Programming Mode

Select, **Up** and **Down** Arrow Keys simultaneously pressed for three seconds - Changes the operation mode of the control from temperature selection to a programming mode. In the programming mode the differential for the pool settings may be adjusted and the temperature display may be selected to show either °F or °C.

The cursor will flash over Pool 1 or Pool 2 when those set points are being changed or over the area between Pool 1 and Pool 2 when the differentials are being adjusted as outlined under *Operating Temperature Control* on page 37.

When the differential and temperature display are selected and there has been a period of 10 seconds with no activity to adjust control settings, the display will revert back to normal display of water temperature.

IMPORTANT: When power is initially applied to a new pool heater, the control points will be pre-programmed. The factory final quality test sets the pool heater for test firing. The preset values are as follows:

Set points – 80°F
Differential – 4°F

NOTE: The control values programmed into memory will not be lost because of a power failure.

Error Messages Displayed by the Temperature Controller

There are three error messages that can be displayed in response to software or hardware problems with the pool heater's internal temperature control. The error codes that may be seen on the display are:

Err - The internal EEPROM of the microprocessor in the temperature control has a read error at power up. This error cannot be field repaired. Replace the pool heater's temperature control if the error persists.

SHr - There is a short in the temperature sensor. Make sure sensors are properly installed, wired and connected to the control. Correct sensor installation or replace sensor.

OPn - There is a break in the wiring to the temperature sensor. Make sure sensors are properly installed, wired and connected to the control. Correct sensor installation or replace sensor.

HOT SURFACE IGNITION SYSTEM

Hot Surface Igniter and Ignition Control Module

This unit has one ignition module and one hot surface igniter.

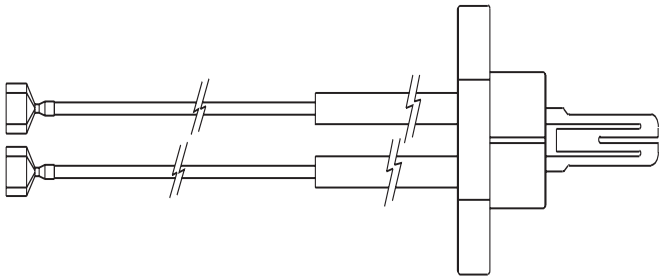


Figure 45 – Hot Surface Igniter

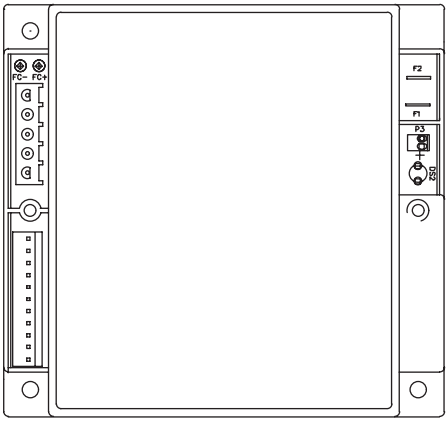


Figure 46 – Hot Surface Ignition Control Module

Hot Surface Ignition Control Module

Ignition Module Lockout Functions

The ignition module may lockout in either a hard-lockout condition, requiring pushing of the reset button to recycle the control, or a soft-lockout condition which may recycle after an approximate five-minute waiting period. This soft-lockout condition is intended to allow self-correcting faults to correct themselves and permit normal operation. A typical hard-lockout fault is a flame failure condition. An ignition module that is in a hard-lockout condition may only be reset by pushing the reset button for the ignition control. The reset button is located on the front of the control panel. Upon a flame failure, the reset button is only active after the control module has completed its post-purge cycle. Turning main power "OFF" and then "ON" or cycling the thermostat will not reset a hard-lockout condition. Wait five seconds after turning on the main power before pushing the reset button when the ignition module is in a hard lockout.

The ignition module will go into a soft lockout in conditions of low air, low voltage or low hot surface igniter current. A soft-lockout condition will operate the combustion air fans for the post purge cycle and then the ignition module will pause for approximately five minutes. At the end of this timed pause, the ignition module will attempt a new trial for ignition sequence. If the soft-lockout fault condition has subsided or has been corrected at the end of the timed pause, main burner ignition should be achieved with the resumption of the normal trial for ignition sequence. If the control sensed fault is not corrected, the ignition module will continue in the soft-lockout condition. If the thermostat opens during the soft-lockout period, the ignition module will exit soft lockout and wait for a new call for heat from the thermostat. A soft-lockout condition may also be reset by manually cycling the thermostat or turning the main power switch "OFF" and then "ON" after the control sensed fault has been corrected.

Diagnostic Status Indication

The ignition module has an LED which indicates the status of the safety circuits. A remote Ignition Module Status indicating light is wired from the ignition module Status LED and mounted on the front control panel. The flashing operation of this light/LED indicates the diagnostic status of the ignition control module. The status LED, mounted on the ignition module, flashes a code sequence from the Ignition Module to indicate the status of the ignition process. See TABLE– O for the flashing diagnostic status codes as signaled by the ignition module.

OPERATION Continued

TABLE-O
Ignition Control Diagnostic Codes

Code Sequence	Condition
Constant ON	System OK, no faults present.
Constant OFF	Possible control fault, check power; LED may be effective, do not replace control if all operational sequences function properly, see TroubleShooting Guide.
One Flash	Low Air, check air pressure switch and hoses to pressure sensing points, fan, venting and sealing of pressurized chamber. ***NOTE:*** Brief flashing normal on fan start-up/proving.
Two Flashes	Flame without call for heat, check for a gas valve stuck in the open position, air, venting, burners and the combustion process. Fan will remain on.
Three Flashes	Lockout due to flame failure, push reset button on inner control panel after correcting ignition problem. Initial heater start up without properly bleeding air from the gas line may require multiple reset functions to achieve proper ignition.
Four Flashes	Igniter failure, igniter will not maintain minimum 2.75 amp current draw, caused by, low voltage, bad wiring/continuity, high resistance or igniter failure.
Five Flashes	Power supply problem, check for low supply voltage or transformer output less than 18VAC.
Six Flashes	Replace ignition module, internal fault.

Access to Internal Control Panel

The control panel is accessed by turning the knurled knob located at the bottom center of the exterior control panel. Pull the panel out at the bottom. The door will tilt into unit until it comes free from the outer top. The outer control panel has an overlay attached to the exterior surface which indicates the function of each of the pool heater's indicating lights and a clear window to view the digital temperature display from the temperature control. The thermostat and diagnostic light board are mounted to the back of the control panel door.

The control panel assembly is mounted on a slide out chassis to allow easy access to the components on the panel. The control panel contains the ignition module, transformer for the 24 VAC control circuit, circuit breaker for the control circuit, switching relays for component operation and wiring harness connections to the pool heater's components. The control panels are common and may be switched between pool heaters for trouble shooting.

Removing the Control Panel

1. Pull the control panel out as far as it goes.
2. Remove the multi-pin connector blocks from the top and right side of the control panel.
3. Use a 1/2" box wrench or socket wrench to remove the bolt on the right side of the control panel.
4. Remove the entire control panel.
5. Reinstall the control panel in the reverse order.

⚠ CAUTION: **Control panel is heavy and awkward to handle when removed. Carefully support the control panel when removing.**

Ignition and Control Timings

Proven Pilot Hot Surface Ignition System M-9 on 500,000 through 2,070,000 Btu/hr models with One Hot Surface Ignition Module.

Hot Surface Ignition Module Timings (Nominal)
Prepurge: 15 Seconds
Hot Surface Igniter Heat-up Time: 25 - 35 seconds
Main Burner Flame Establishing Period: 4 Seconds
Failure Response Time: 0.8 Seconds at less than 0.5 µA flame current
Flame Current: 5 - 15 µA
Post-purge: 30 Seconds
Optional Pump Delay Timing: 30 Seconds after burner shutdown

OPERATION AND DIAGNOSTIC LIGHTS

The control panel has six indicating and diagnostic lights to show all major steps of operation and control sensed malfunctions.

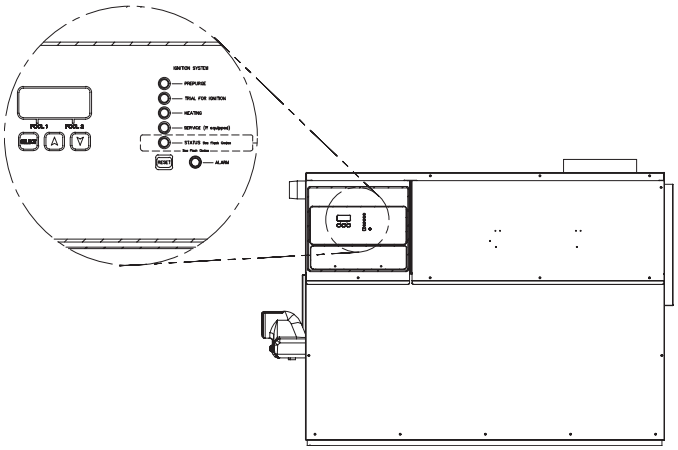


Figure 47 – Exterior Control Panel with Operation/Diagnostic Lights and LCD Display

TABLE-P
Status LED Diagnostic Codes

Code Sequence	Condition Lights
Prepurge	Operation of combustion air fans before ignition.
Trial for Ignition	Hot surface igniter 1 preparing to light burners.
Heating	Burners operating.
Service (if equipped)	Service Indicator when option purchased.
Alarm	Indicates flame failure on either ignition module and will indicate additional alarms if the alarm of any failure option is purchased.

Control of Condensate Formation and Water Velocity

IMPORTANT: To control condensate formation and ensure proper velocity through the heat exchanger, you must regulate the inlet water temperature and temperature rise across the heat exchanger.

Temperature rise is the difference between inlet and outlet water temperature across the heat exchanger in the pool heater.

This adjustment procedure must be followed on initial startup of the pool heater and after the pool has reached desired operating temperature. The minimum inlet temperature and temperature rise should then be periodically rechecked in routine maintenance. Inlet water temperature to the heat exchanger must be 135°F or higher to prevent the formation of condensate in the combustion chamber and venting system.

Condensate formation causes non-warrantable operational problems and a hazard from flue gas spillage if allowed to persist for extended periods of operation. The correct temperature rise across the heat exchanger ensures proper velocity in the tubes to help control scale formation in the heat exchanger tubes. This will yield long life and economical operation from your pool heater. Excessive lime/scale build-up in the tubes is caused by low water velocity through the pool heater.

Excessive pitting or erosion in the tubes is caused by high water velocity through the tubes. Check the discharge piping from the pool heater to the filter system. This piping must be either copper pipe or high temperature CPVC plastic.

Follow the steps below to adjust the bypass on the pool heater:

1. The pool heater is equipped with two immersion thermometers placed in wells on the inlet and outlet of the heat exchanger's front header. These will be used to read water temperature for bypass adjustment. With the pump running and the pool heater off, both of the thermometers should read the same temperatures before startup. If they do not, an adjustment must be made to your final calculation of temperature rise.
2. The factory supplied copper bypass mounted on the pool heater is equipped with two valves. The valve in the outlet to the pool should be placed in the half closed position for initial start up of a cold pool. The valve in the crossover pipe to the pump inlet should be in the full open position on initial startup.
3. Turn the pool heater "ON" and allow time for the water temperature to stabilize. Observe the inlet water temperature and the difference between inlet and outlet temperatures. This difference between inlet and outlet water temperature is the "temperature rise".

NOTE: Check the bypass pump rotation. Proper rotation is "clockwise" ↱ as viewed from the end of the pump motor.

4. Adjust the valve in the bypass discharge to obtain a minimum of a 135°F water temperature at the inlet of the heat exchanger. This prevents the pool heater from condensing. Compare the temperature rise observed on the pool heater with the required temperature rise for the Btu/hr input of your heater as shown in Table-Q. Adjust the valve in the crossover pipe on the bypass to set the

OPERATION Continued

desired temperature rise. It may be necessary to also make a small adjustment to the valve in the bypass discharge to achieve proper temperature rise.

5. **If the temperature rise is too high, the water velocity is too low. Readjust the valves in the bypass.** Check the following:
   a. Check for restrictions in the outlet of the pool heater.
   b. Ensure that any additional valves between the pool heater and the filter system are open.
   c. Check the pump to be sure it is running properly and that the pump motor is running in the proper direction.
   d. Ensure that the installed piping between the pool heater and filter system is not less than 2 1/2" in diameter. Common manifold piping for multiple pool heater installations will require larger minimum pipe sizes to ensure proper flow. See Table-S.
6. Set the adjustable high limit control to 200°F.
7. **If the temperature rise is too low, the water velocity is too high. Adjust the valves in the bypass as follows:**
   a. Slowly throttle the valve in the crossover pipe of the pool heater until the temperature rise is steady at the required temperature rise as noted in Table-Q.
   b. Additional adjustment of the valve in the discharge of the bypass may be required.
   c. Sustained high water velocity and low temperature rise may result in pitting or erosion of the copper tubes in the heat exchanger. This is a non-warrantable failure.
8. Temperature rise must be properly adjusted to achieve the specified flow rate.
9. Once the pool has reached the desired operating temperature it may be necessary to reset the valves in the bypass. This is required because the temperature of the pool water coming to the pool heater will be substantially higher than on initial cold startup.

TABLE-Q
Temperature Rise Chart

Btu/hr Input	Temperature Rise °F
500,000	15
650,000	20
750,000	23
990,000	19
1,260,000	24
1,440,000	27
1,800,000	34
2,070,000	39

Water Chemistry

Factors which affect pool water and, more importantly, the efficiency of your new pool heater are:

1. Proper Filtration
2. Proper Circulation
3. Disinfection and Oxidation
4. pH Control and Total Alkalinity
5. Algae Control

The water chemistry of your pool changes daily due to natural evaporation of the water and the addition of chemicals. Chemicals are used to sanitize and control algae growth in the pool. Their addition must be carefully monitored. If there is an imbalance in the pool water chemistry, the minerals in the pool water will precipitate out and collect in the pool, filter system and the pool heater. The accumulation of minerals or scale in the pool heater due to a chemical imbalance will cause a non-warrantable failure of the heat exchanger and its components. pH is an important factor in maintaining proper balance in your pool water. pH is the measurement of the acidity or alkalinity of water. The following chart shows the recommended pH range and what can happen when the pH increases or decreases from the ideal of 7.2 to 7.8.

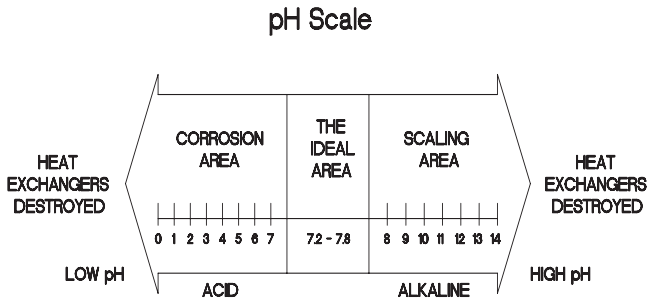


Figure 48 – pH Scale

If the pH becomes too high, it lowers the ability of chlorine to destroy bacteria and algae, water can become cloudy, filter elements may become blocked, and scale formation will occur in the pool and heat exchanger. If the pH becomes too low the water becomes acidic. You can have eye burn and skin irritation, etching of the plaster, corrosion of metal fixtures and the resulting stains on the plaster, degradation of sand and gravel filters and corrosion of the copper tubes in the heat exchanger.

Damage to the pool heater due to improper water balance is non-warrantable.

We recommend using a four-way test kit to monitor the following levels to ensure proper operation of your pool heater:

TABLE-R Recommended Water Chemistry	
Test	**Recommended Level**
Correct pH	7.2 - 7.8
Chlorine Residual	1.0 - 5.0 PPM
Total Alkalinity	80 - 120 PPM
Calcium Hardness	175 - 350 PPM

Chlorine residual is the chlorine remaining in the pool water after it is consumed in the process of destroying bacteria, algae and other oxidizable materials. Total alkalinity is the measurement of the total amount of alkaline chemicals in the water. Alkalinity controls pH. Sodium bicarbonate is used to raise total alkalinity. Calcium hardness can be raised by the addition of calcium chloride, and lowered by the addition of Tri-sodium Phosphate or its equivalent. The corrosive level of pool water can also be measured by the Ryznar Stability Index. This index is calculated by a formula which uses operating temperatures, total alkalinity, pH, calcium hardness and total dissolved solids. The Ryznar Stability Index is able to predict more accurately the scaling or corrosive tendencies of swimming pool water. Balanced water within the guidelines of the Ryznar Stability Index are from 6.3 - 6.7. Use of the Ryznar Stability Index may help prolong the service life of pool equipment, which in turn will be a cost savings to the commercial pool owner. Your pool dealer can provide additional data and equipment to make this measurement if a problem exists.

Pipe Size Requirements

The pipe sizing chart provides the minimum pipe size for common manifold piping to ensure adequate flow.

TABLE-S Pipe Sizing Chart	
Number of Units 500,000 - 750,000 Btu/hr Models	**Common Pipe Size (Min.)**
1	2"
2	3"
3	3 1/2"
4	4"
5	5"
6	5"
Number of Units 990,000 - 2,070,000 Btu/hr Models	**Common Pipe Size (Min.)**
1	2 1/2"
2	4"
3	4"
4	5"
5	6"
6	6"

Circulating Pump

1. This pool heater is factory supplied with a properly sized pump that circulates water between the pool heater and system.
2. Pump is sized to pool heater input and water hardness. See Water Chemistry on page 42.
3. Lubricate the pump to the manufacturer's recommendations. Pump damage due to inadequate lubrication is non-warrantable. Use SAE 30 non-detergent oil or lubricant specified by the pump manufacturer.
4. Standard pool heaters are furnished with the following circulating pump mounted in the factory supplied pool loop.

500,000 - 750,000 Btu/hr Models 1/4 HP, 120 VAC, 5.8 Amp
990,000 - 2,070,000 Btu/hr Models 1/2 HP, 120 VAC, 7.4 Amp

This pump is sized based on installation of a single pool heater in close proximity with the system. If the number of fittings and straight pipe exceeds the quantities shown in this section, a larger pump will be required. As an alternative to changing the pump in these circumstances, the piping can be changed to a sub-loop.

OPERATION Continued

The standard pump selection is based on the following pipe and fittings from the pool heater to the system:

6 - 90° elbows **2 - ball valves**
2 - unions **1 - cold water tee**

Not more than 45 feet of straight pipe.

IMPORTANT: For every elbow and tee in excess of those shown above, deduct 5 feet from the maximum allowable straight pipe in the pool heater to the system circulating loop.

Minimum Pump Performance

Pump performance is based on providing adequate flow and temperature rise to prevent scale accumulation in the heat exchanger. See *Water Chemistry and Bypass Adjustment* on page 42.

TABLE-T
Minimum Pump Performance

Btu/hr Input	GPM	Ft.Hd.
500,000 - 750,000	55	10
990,000 - 2,070,000	90	15

Heat Exchanger

This is a highly sophisticated heat exchanger, designed to carry water in such a way that it generates a scouring action which keeps all interior surfaces free from build-up of impurities. The straight-line, two pass design of the tubes sends water into the headers at a properly rated velocity. The configuration of the headers, in turn, creates a high degree of turbulence which is sufficient to keep all contaminants in suspension. This "scouring action" provides greater cost savings for owners. Tubes are always able to transfer heat at peak efficiency. Every surface within this water containing section is of a non-ferrous material, providing clear, clean, rust-free water. Straight copper tubes-finned on the outside for maximum heat transfer-coated cast iron one piece cored headers make up an entirely rust-proof pool heater. On all models, header inspection plugs can be removed for field inspection and cleaning of copper tubes. The entire heat exchanger may be easily removed from the pool heater.

⚠ WARNING: **Should overheating occur or the gas supply fail to shut off, do not turn off or disconnect the electrical supply to the pump. Instead, shut off the gas supply at a location external to the pool heater**.

High Water Temperature Limit Control

This pool heater is equipped with a fixed setting, auto reset high water temperature limit control that is screwed into the outlet head in the heat exchanger. This temperature limit control has a maximum limit setting of 200°F (93°C). It is also equipped with an adjustable setting, manual reset high water temperature limit control. This temperature limit control has a maximum limit setting of 230°F (110°C). If water temperature exceeds the set point, the limits will break the control circuit and shut down the pool heater. The auto reset limit control will only be reset after the water temperature has cooled below the set point of the limit. The manual reset limit control will require an operator to push the reset button (located immediately below the high limit dial) if this limit has tripped.

CLEANING AND MAINTENANCE

Listed below are items that must be checked to ensure safe reliable operations. Verify proper operation after servicing.

⚠ CAUTION: **Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation.**

Appliance Area

Keep appliance area clear and free from combustible materials, gasoline and other flammable vapors and liquids.

Water Circulating Pump

Inspect the pump every six months and oil as necessary. Use SAE 30 non-detergent oil or lubricant specified by the pump manufacturer.

Burner Flames

Visually check the main burner flames at each start up after long shutdown periods or at least every six months. Burner view ports are located on the right and left sides of the pool heater.

⚠ WARNING: **The areas around the burner view ports are hot. Direct contact with the pool heater could result in burns.**

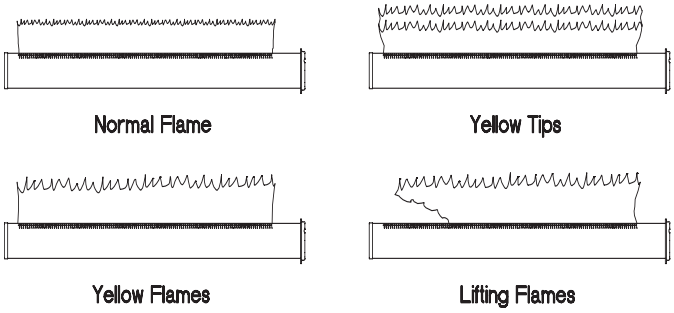


Figure 49 - Flame Pattern Illustration

Normal Flame: A normal flame is blue with slight yellow tips, has a well-defined inner cone, and displays no lifting flames.

Yellow Tips: The usual causes for yellow tips on the burner flame are burner air flow blockage or partial obstruction.

Yellow Flames: The usual causes for yellow flames are primary air flow blockage to the burner(s) or excessive gas input. Correct this condition immediately.

Lifting Flames: The usual causes for lifting flames are over firing the burner(s), excessive primary air, or high draft.

If you observe improper flame patterns, examine the venting system, ensure proper gas supply, and ensure adequate supply of combustion and ventilation air.

Flue Gas Passageways Cleaning Procedures

Any sign of soot around the refractory, at the burners or in the areas between the fins on the copper heat exchanger indicates a need for cleaning. The following cleaning procedures must only be performed by a qualified serviceman or installer. Proper service is required to maintain safe operation. Properly installed and adjusted pool heaters seldom need flue cleaning.

IMPORTANT: All gaskets on disassembled components must be replaced with new gaskets on reassembly. Gasket kits are available from your distributor.

Burner Removal and Cleaning

1. Turn “OFF” the main power to the pool heater.
2. Turn “OFF” the main manual gas shutoff to the pool heater.
3. Remove the front outer jacket panels.
4. Disconnect the manifold from the gas train using the union(s) just below each gas valve(s).
5. Remove the mounting nuts from the manifold mounting brackets. Pull the manifold/orifice assembly away from the burners. Repeat for each manifold assembly.
6. Remove two mounting screws from the burner and slide the burner out toward the front of the pool heater. Use caution to prevent damage to burners, refractory, hot surface igniter or wiring.
7. Remove soot from the burners with a stiff bristle brush. Dirt may be removed from the burner ports by rinsing the burner thoroughly with water. Drain and dry burners before re-installing. Damaged burners must be replaced.

When installed in a dusty and dirty location, the burners may require cleaning on a 3 to 6 month schedule or as needed, based on severity of contamination. Contaminants can be drawn in with the combustion air. Non-combustible particulate matter such as dust, dirt, concrete dust or dry wall dust can block burner ports and cause non-warrantable failure. The standard inlet air filter will help eliminate dust and dirt from entering the pool heater.

Heat Exchanger Cleaning

1. While burners are removed, check the heat exchanger surface for sooting. If present, the heat exchanger must be cleaned and the problem corrected. Proceed as follows.
2. Remove gas manifold(s)/orifice assemblies as described in steps 1 through 5 in Burner Removal and Cleaning, this page.
3. Disconnect the wiring from the hot surface igniter and the hoses from the burner pressure tap.
4. Remove inner jacket panel mounting screws and slide the door assembly out toward the front of the pool heater. Use caution to prevent damage to the refractory and hot surface igniter.
5. Check “V” baffles along the front and back edges of the heat exchanger. Remove and clean if necessary.
6. Remove soot from the heat exchanger with a stiff bristle brush. Use a vacuum to remove loose soot from the surfaces and inner chamber.
7. The heat exchanger can be removed by sliding towards the front of the pool heater. Once the heat exchanger is removed from the pool heater, a garden hose can be used to wash the tubes to ensure that all soot is removed from the heat exchanger surfaces.

NOTE: Do not wet the pool heater’s refractory.

8. Ensure that all burner ports are cleaned to remove any soot. See *Burner Removal and Cleaning*, this page.
9. Carefully reinstall the heat exchanger, “V” baffles, and frame runners if removed from the pool heater.

CLEANING AND MAINTENANCE Continued

NOTE: Make sure frame runners seal securely where they contact the front and rear compartment refractory.

10. Carefully reinstall inner jacket panels, burners, manifolds, wires and hoses. Use new gasket material to ensure a proper air seal.
11. Reassemble all gas and water piping. Test for gas leaks.
12. Reassemble outer jacket panels.
13. Cycle the pool heater and check for proper operation.

Electrical

This pool heater uses a transformer to supply a low voltage control circuit. The voltage on the secondary side should be 24 to 28VAC when measured with a voltmeter. This unit has a 7 AMP circuit breaker provided on the secondary side of the transformer. A tripped circuit breaker indicates a short in the 24VAC controls that must be corrected.

Combustion and Ventilation Air

Combustion Air Filter

This unit has a standard air filter located at the combustion air inlet. This filter helps ensure clean air is used for the combustion process. Check this filter every month and replace when it becomes dirty. The filter size on the *500,000 - 750,000* Btu/hr models is 12" x 12" x 1" (30.5cm x 30.5cm x 2.5cm) and 16" x 16" x 1" (40.6cm x 40.6cm x 2.5cm) on the *990,000 - 2,070,000* Btu/hr models. You can find these commercially available filters at any home center or HVAC supply store.

Venting System

Examine the venting system at least once a year. Check more often in the first year to determine inspection interval. Check all joints and pipe connections for tightness, corrosion or deterioration. Clean screens in the venting air intake system as required. Have the entire system, including the venting system, periodically inspected by a qualified service agency.

Air Flow

Check frequently to be sure the flow of combustion and ventilation air to the pool heater is not obstructed.

Combustion Air Fans

Both the *500,000 - 750,000* Btu/hr models and the *990,000 - 2,070,000* Btu/hr models use a fan-assisted combustion process. The *500,000 - 750,000* Btu/hr models have one fan and the *990,000 - 2,070,000* Btu/hr models use two fans to supply combustion air to the burners.

Fan Cleaning

Check each combustion air fan every six months. Clean the fan as required when installed in a dusty or dirty location. Oiling is not required.

Combustion Air Fan Adjustment

The combustion air fans are factory pre-set and should not need adjustment in most cases. Follow the steps below to adjust the fan if a continuous Low Air status code occurs.

NOTE: On the *500,000 - 750,000* Btu/hr models the air shutter is adjusted on the side of the fan duct as depicted in Figure 50. On the *990,000 - 2,070,000* Btu/hr models the air shutter is adjusted on the rear of the fan duct as depicted in Figure 52.

1. Check for proper installation and draft in the venting system. Correct as required.
2. The following pressure settings are for installations up to 2000 feet altitude. Contact the factory for high altitude air pressure settings.

Adjusting Differential Air Pressure

The following is a recommended method for setting the differential air pressure (△P) for each fan.

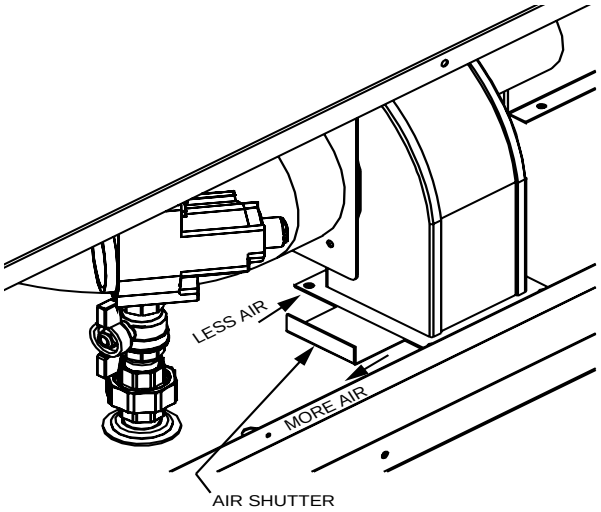


Figure 50 – Adjusting Air Shutter 500,000 - 750,000 Btu/hr

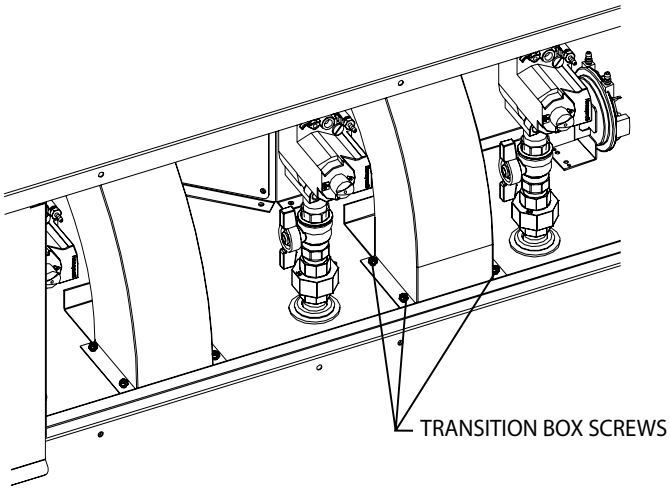


Figure 51 – Loosening Fan Transition Box Screws

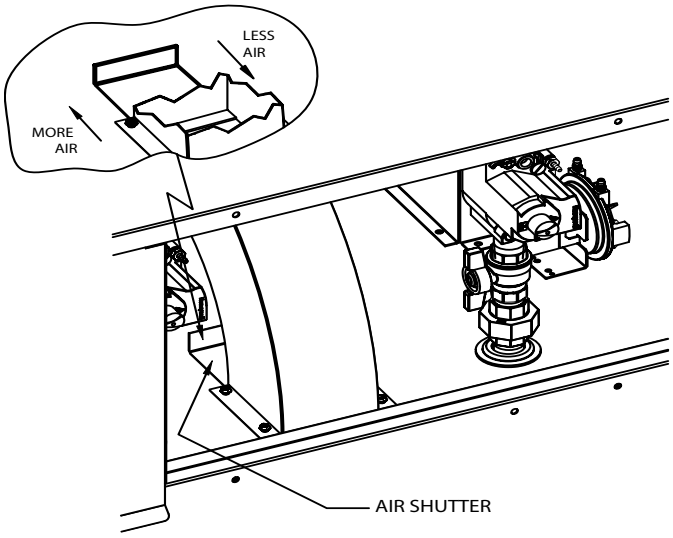


Figure 52 – Adjusting Air Shutter 990,000 - 2,070,000 Btu/hr Models

Set-Up Procedure

Beside the fan duct is an air pressure switch with a large and a small tube delivering pressure from points inside the pool heater (see Figure 53). The pressure in the large tube is the chamber pressure. The pressure in the small tube is the burner pressure. They act together to make the pressure switch. By disconnecting the caps from the tees in the pressure switch hoses and connecting them to either side of a manometer, you can read the differential pressure to the switch.

The left pressure tapping connection on the manometer connects to the tee in the tubing from the pool heater front chamber and the right pressure tapping connection on the manometer connects to the tee in the small tubing from the burner.

If the air pressure switch does not make within 60 seconds from the time the fans turn ON, the ignition module will go into a soft lockout period (approximately 5 minutes in duration) during which time the fans are turned off and the module shows the **Low Air** flash code. If necessary, soft lockout can be circumvented by cycling power using the ON/OFF switch to cycle power to the unit.

NOTE: If the pool heater has been firing recently, allow the pool heater to cool for five minutes with the fans running before beginning the adjustment procedure.

Retain the plastic caps removed from the tees for reinstallation when complete.

Adjustment Procedure

1. Remove the upper front jacket panels from the unit to access the upper chamber.
2. Slightly loosen screws that attach fan transition box to metal base (see Figure 51).
3. Depending on model, the air shutter(s) may be located either on the side or the rear of the fan duct. Locate the air shutter at the side/rear of the fan duct (see Figure 50 and 52). Move the air shutter towards the rear or left side of the unit to increase air pressure. Move the air shutter towards the front or right side of the unit to decrease air pressure.

4a. On the *990,000 - 2,070,000* Btu/hr models adjust the air shutter on the left fan until the differential pressure is nominally 1.1 - 1.3 inches water column.

4b. The *500,000 - 750,000* Btu/hr models have one fan with a side mounted air shutter. The differential for these models is nominally 1.5 - 1.65 inches water column.

5. Reattach the hoses to the pressure switch and locate the air switch adjacent to the right fan and connect the tubes to either side of your manometer.
6. Adjust the air shutter on the right fan until the differential pressure is nominally 1.1-1.3 inches water column.
7. Once the adjustment procedure is complete, reattach the caps to the tees in the hoses to the pressure switches and check all tubing and wire connections for snug fit. Test fire the unit. Install upper panels.

CLEANING AND MAINTENANCE Continued

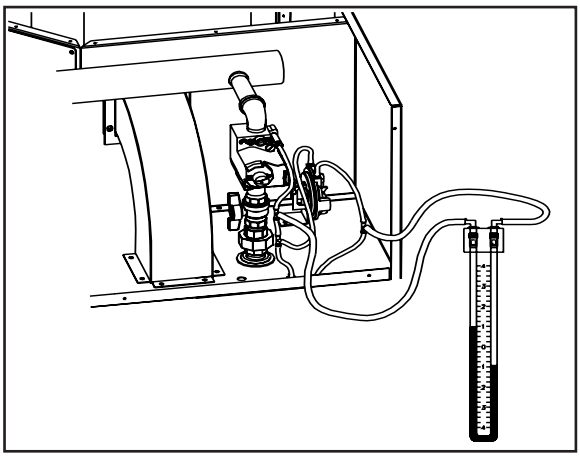


Figure 53 – Combustion Air Adjustment with a Manometer to Set Differential Pressures

Servicing Hot Surface Igniter and Ignition Module

This pool heater uses a proven hot surface ignition control module and a hot surface igniter. The hot surface ignition module is not repairable. Any modification or repairs will invalidate the warranty.

⚠ WARNING: Do not attempt to repair a faulty hot surface igniter or ignition module. Any modification or repairs may create hazardous conditions that result in property damage, personal injury, fire, explosion and/or toxic gases.

A faulty hot surface igniter or ignition module must be replaced with an identical part. A specification igniter and ignition control module for this specific pool heater is available from your local distributor. Do not use general purpose field replacement ignition modules or igniters.

Ignition System Checkout

1. Turn “OFF” the gas supply to the pool heater.
2. Turn the electric power “ON”.
3. Program the temperature control to settings above water temperature or to the highest safe setting.
4. The igniter will cycle on trial for ignition.
5. The ignition module will lock out and turn the alarm light on.
6. Program the temperature control to the desired temperature set point.
7. Turn “ON” the gas supply.
8. Press the module reset button (located on the front of the unit) to reset the module.
9. If ignition system fails to operate properly, repair work must be performed by a qualified serviceperson or installer.

ENERGY SAVING RECOMMENDATIONS

1. Keep the pool covered when not in use. This will cut heating cost, reduce water evaporation, conserve chemicals and reduce load on the filtering system.
2. Reduce pool thermostat to 78°F or lower.
3. Use an accurate pool thermometer to monitor water temperature.
4. Use a time clock to start filter pump no earlier than 6 a.m. during pool season. This is the time when nightly heat loss stabilizes.
5. Turn the pool heater “OFF” and drain during long periods when the pool will not be used (winter, vacations, etc).
6. Follow a regular program of preventative maintenance for your pool heater each new swimming season. Check heat exchanger, controls, burners and operation of the pool heater.
7. For pools used only on weekends, the thermostat may be set lower than 78ºF during the week. Lower setting to a range that can be easily achieved in one day's operation of the pool heater.

SEQUENCE OF OPERATION

OVERVIEW

This sequence of operation can be considered the order of events in sequential order that occur after the pool heater has received a call for heat. The process begins with 120VAC power entering the pool heater and ends with the pool heater going into an idle state after completion of a successful call for heat. ***NOTE:*** **The following descriptions do not include remotely connected devices that may be connected to the pool heater. Refer to the wiring diagram for actual point to point wiring connections that show power delivery.**

POWER SUPPLY

120VAC/60Hz/1PH power connects to black (line) and white (neutral) wires located within an electrical wiring box located on the left side of the pool heater. A green chassis grounding wire is also provided for connection to earth ground.

ON/OFF ROCKER SWITCH

The black line voltage wire runs directly to a single pole, single throw On/Off rocker switch located behind the front cover accessible by a knurled knob. Turning ON the rocker switch delivers line voltage to the low voltage transformer and ignition module.

NOTE: The On/Off switch does not provide for disconnection of power being supplied to any remotely connected devices that may be connected to the pool heater (i.e. pumps, louvers, power venters, etc.). As such, it may be necessary to locate and turn "OFF" power to these items before attempting to service the pool heater.

LOW VOLTAGE SUPPLY TRANSFORMER

A 120VAC to 24VAC transformer located within the control panel provides 24VAC/60Hz to many of the components located on the pool heater. One of its 24VAC outputs (blue) is connected to a circuit breaker and the other (yellow) is connected to chassis ground.

24VAC CIRCUIT BREAKER

A circuit breaker is provided for protection of the low voltage supply transformer from overloads and short circuits. The breaker is located inside the pool heater on the right rear of the control panel. Power from this breaker goes to the temperature controller, ignition module and various other components and/or options on the pool heater. When tripped, all factory-installed 24VAC components will lose their 24VAC power.

MANUAL RESET HIGH-LIMIT THERMOSTAT

A manual reset high limit thermostat is provided as backup for the auto reset high limit. This is an adjustable dial, bulb-capillary style thermostat that will trip and require resetting should water temperature exceed its settings. When tripped, all controls remain powered, but 24VAC is prevented from being delivered to the ignition module's thermostat input.

EMS/SEQUENCER/REMOTE AQUASTAT TERMINALS

The EMS/sequencer/remote aquastat terminals are provided for connection of the pool heater to an external energy management system or sequencer and are located along the top edge of the terminal strip located within the electrical wiring box. In addition to providing a means to externally fire the pool heater, these terminals also provide for remote shutdown by routing through dry contacts from external devices. Connection of the external dry contacts to these terminals requires the removal of one or more factory-installed jumpers located on the terminal strip.

SAFETY DEVICE TERMINALS

The safety device terminals ensure that no power can be delivered to the ignition module unless factory/field-installed safety devices such as flow switches and gas pressure switches are closed. These safety device terminals are located below the EMS/Sequencer/Remote Aquastat terminals located within the electrical wiring box. Two types of connections are offered: Continuous terminals provide for connection of safety devices that are desired to be constantly monitored. Intermittent terminals are provided for devices that are only monitored during a "call for heat" cycle. Connection to either of these terminals requires the removal of a factory-installed jumper located on the terminal strip.

TEMPERATURE CONTROLLER

(Operator) A single-stage temperature controller is provided on the pool heater and it serves to maintain one of two user selectable temperature set points. In addition to maintaining a set point, it can provide for desired differential setting. Ultimately, the temperature controller delivers 24VAC to the ignition module and pressure switch when it senses heat mode is desired.

IGNITION MODULE

(Controlled by Temperature Controller)

One ignition module is provided on the pool heater. Upon sensing the 24VAC delivered to it by the temperature controller, the ignition module checks for a shorted pressure switch and then, provided the air switch isn't shorted, supplies 120VAC to its blower output relay and waits for a pressure switch signal.

BLOWERS

(Controlled by Ignition Module and Relay Board)

Two blowers serve to provide combustion air to the pool heater. Both blowers operate in tandem anytime the ignition module is given a call for heat signal.

PRESSURE SWITCH

(Activated by Blower Turning On)

One pressure switch is provided to monitor its On/Off operation. Upon a call for heat, 24VAC is delivered to the pressure switch. If the blower generates adequate air pressure, the pressure switch closes to deliver 24VAC to the ignition module's pressure switch monitoring input terminal.

PREPURGE

(Ignition Module Function)

Once the ignition module sees a 24VAC input from its pressure switch, it runs the blowers for approximately 15 seconds in order to purge the combustion chamber of any unburned fuel/air mixture.

IGNITER WARM-UP AND PROVING

(Ignition Module Function)

Once the ignition module has completed its prepurge period, it turns on the hot surface igniter. Once the hot surface igniter's current draw reaches a proper level, the ignition module begins an additional period of approximately 25 seconds for the igniter to ensure the ignition temperature is attained to ignite the fuel/air mixture.

SEQUENCE OF OPERATION Continued

IGNITER

(Controlled by Ignition Module)

One igniter is provided in order to ignite the fuel/air mixture and its operation and timings are controlled by the ignition module.

IGNITION AND FLAME PROVING

(Ignition Module Function)

Once the warm-up and proving period has been completed, the ignition module sends 24VAC to the gas valves on approximately half of the pool heater. These gas valves should open and allow gas to flow to the burners. The fuel/air mixture should ignite from the hot surface igniter. Once this voltage has been sent to the valves, the hot surface igniter is turned "OFF". The ignition module then monitors and proves the presence of the flame and will either allow operation to continue or shut down the gas valves should flame not be proven and proceed to a Flame Failure condition. If flame was proven briefly during the ignition period, the module may not proceed to Flame Failure, but rather post-purge and then go into another trial for ignition.

TIME DELAY RELAY BOARD

(Controlled by Temperature Controller and Ignition Module)

A small time delay is provided to delay the opening of approximately half of the valves until the first half of the valves have opened and the gas has successfully ignited and established flame on the burners.

HEAT TRANSFER PROCESS

(Gas Valves, Burner and Heat Exchanger)

Once flame has been proven, the ignition module will hold the gas valves open as long as there is proof of flame and a call for heat is present. When the temperature of the water reaches that of the programmed set point, the pool heater will be shut down.

POST-PURGE

(Ignition Module Function)

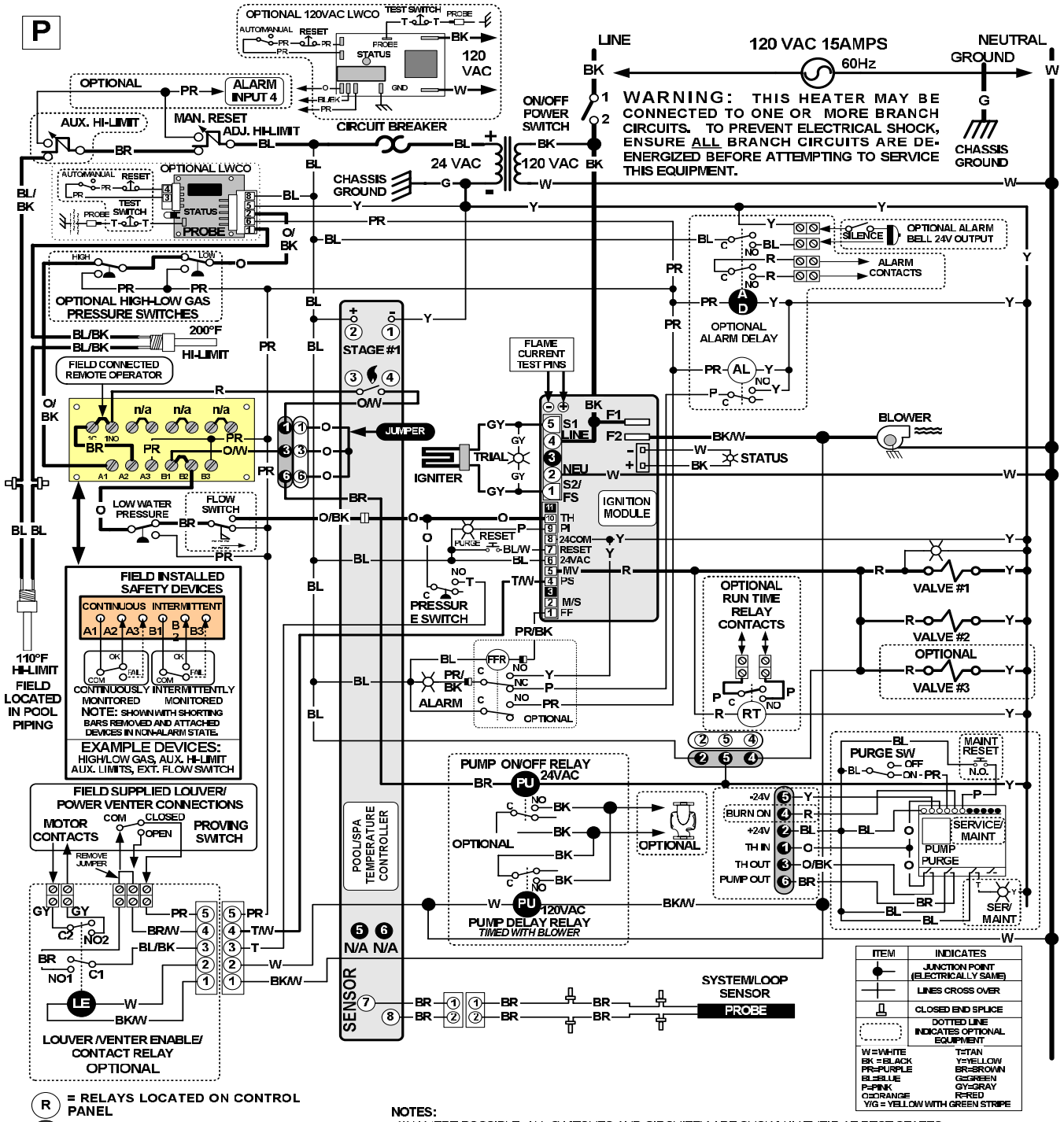
When 24VAC is removed from the ignition module's thermostat input, the module turns "OFF" the gas valves and maintains the blowers for approximately 25 seconds in order to allow the combustion chamber to be purged of all combustion byproducts.

IDLE

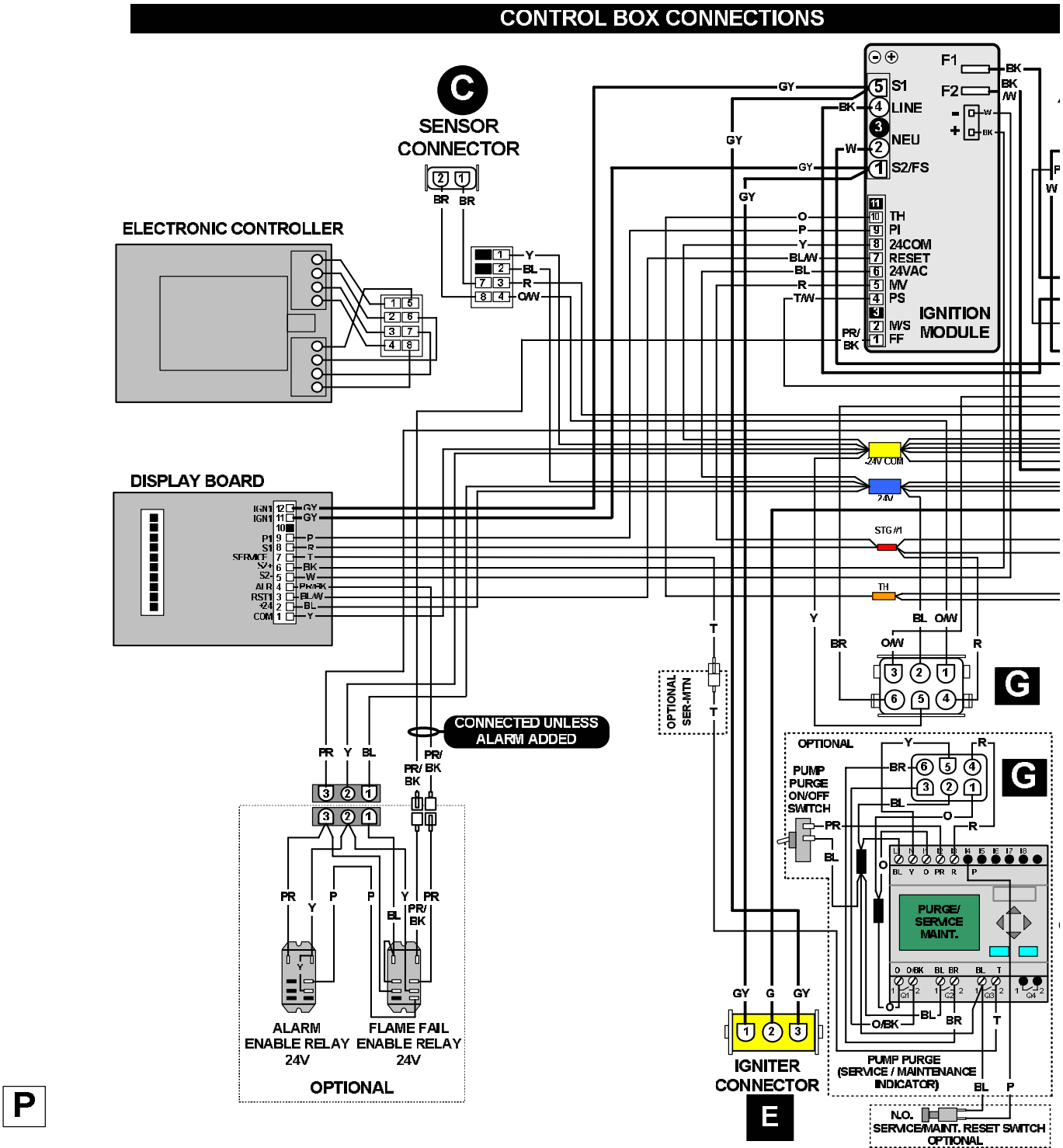
(Temperature Controller Function)

After completion of the post-purge cycle, the pool heater will go into an idle state whereby the temperature controller continuously monitors the water temperature until the water temperature drops to levels that require additional heat.

SCHEMATIC DIAGRAM 500,000 - 750,000 BTU/HR MODELS

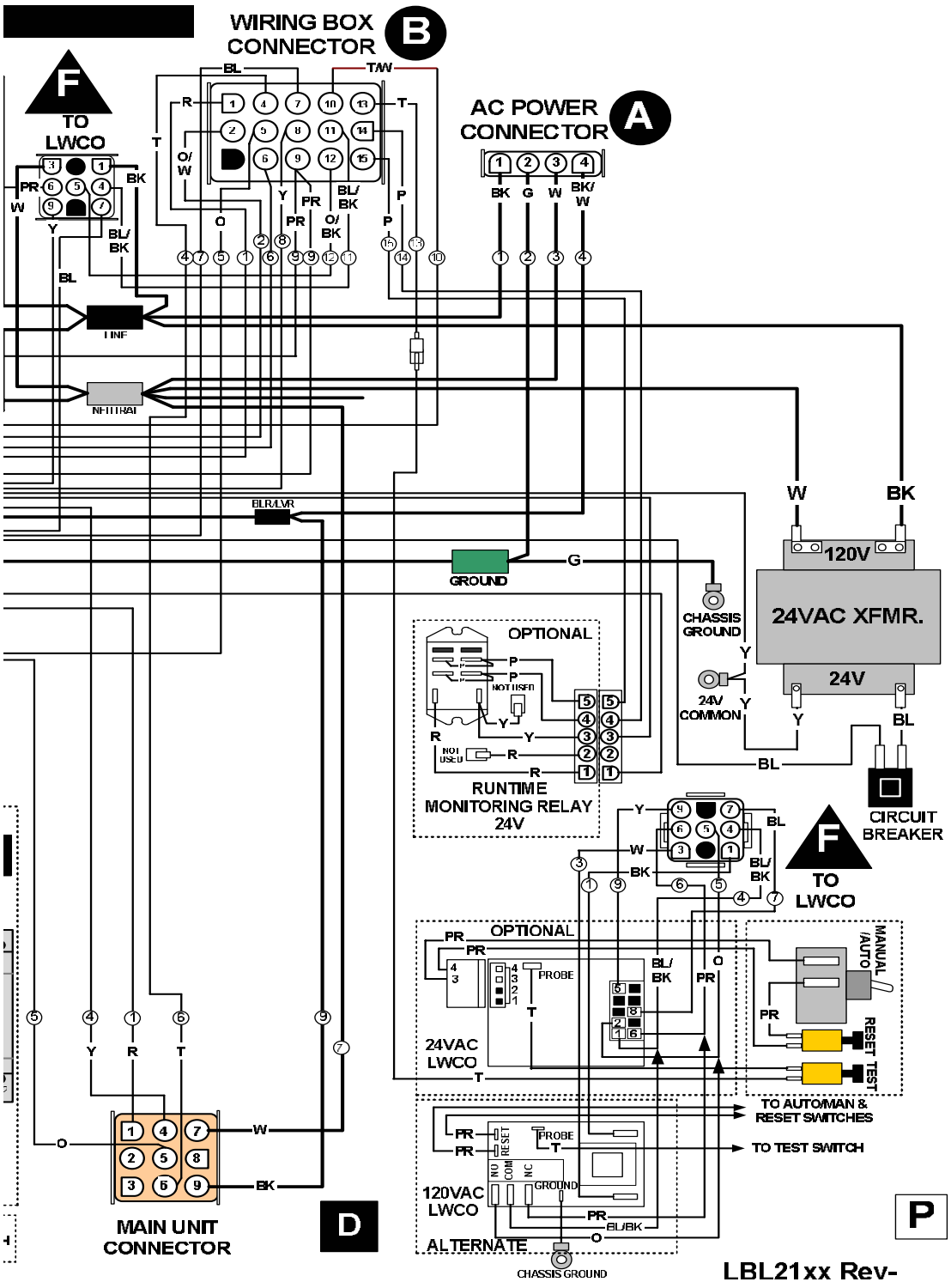


CONTROL BOX CONNECTIONS 500,000 - 750,000 BTU/HR MODELS



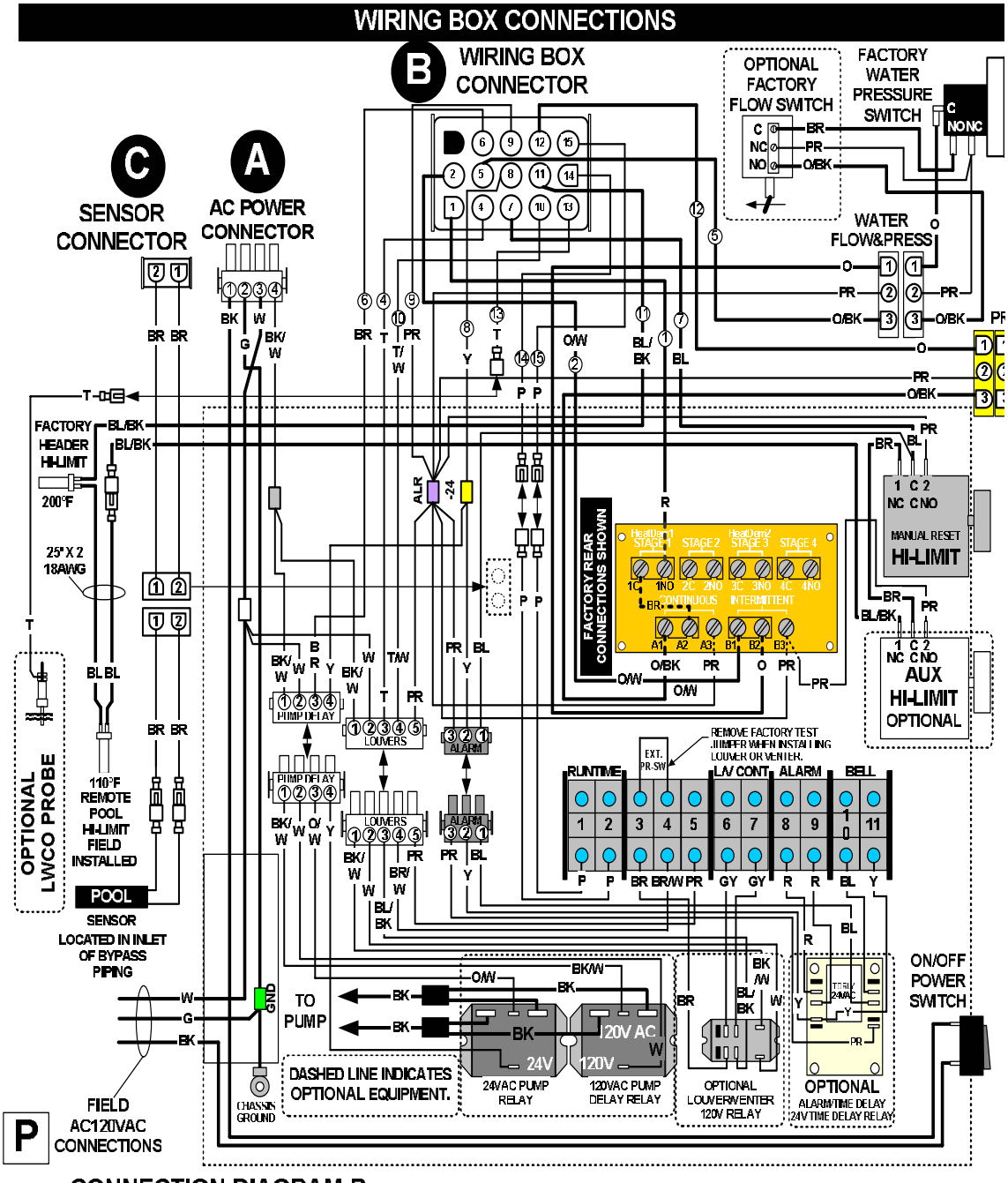
CONNECTION DIAGRAM A

CONTROL BOX CONNECTIONS 500,000 - 750,000 BTU/HR MODELS (CONTINUED)



Commercial Pool Heaters

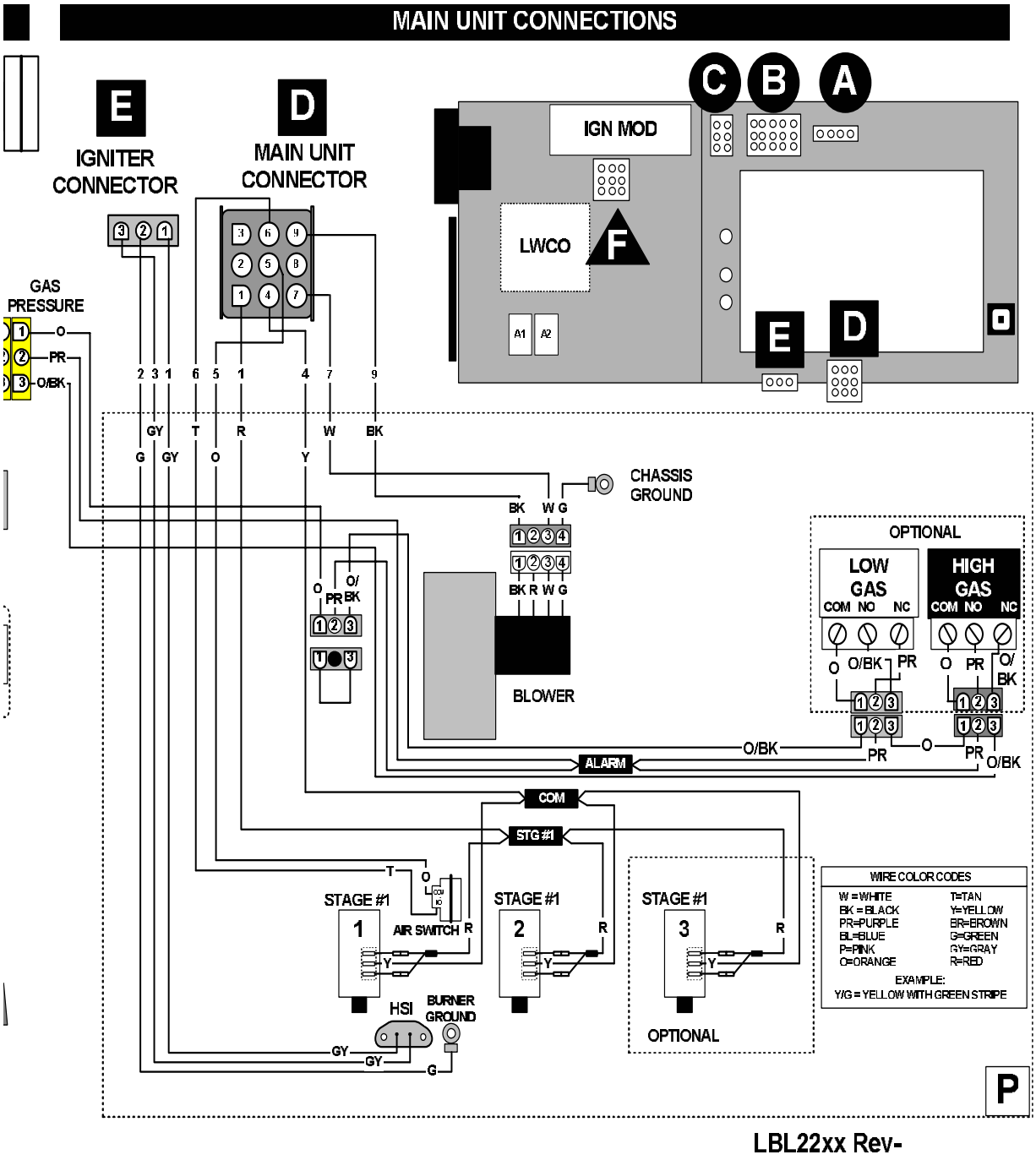
WIRING BOX CONNECTIONS - WIRING DIAGRAM B
500,000 - 750,000 BTU/HR MODELS



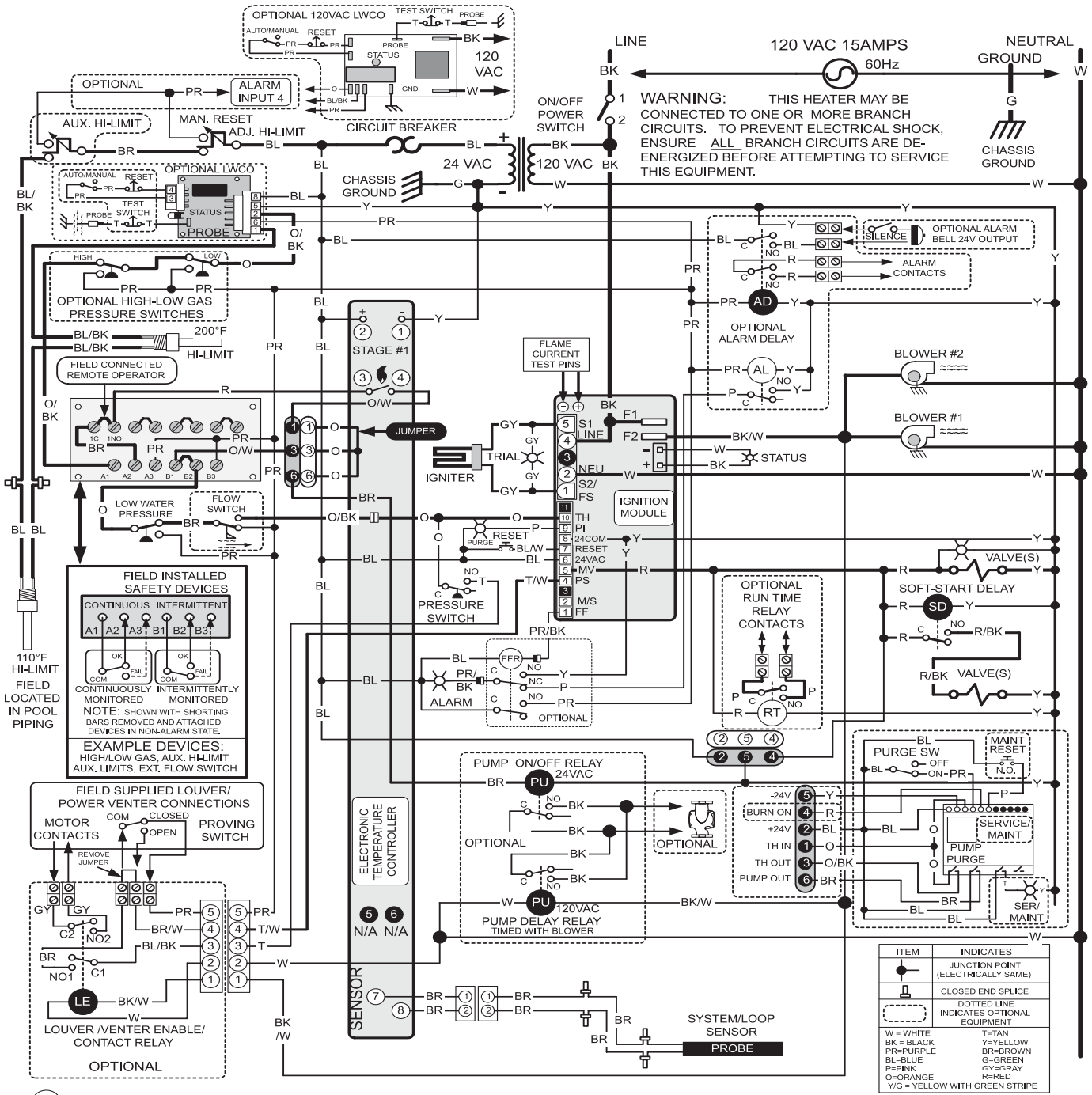
CONNECTION DIAGRAM B

NOTE: WHEN REPLACING DAMAGED WIRING, USE EQUIVALENT TYPE AND GAUGE.

WIRING BOX CONNECTIONS - WIRING DIAGRAM B
500,000 - 750,000 BTU/HR MODELS (CONTINUED)



SCHEMATIC DIAGRAM 990,000 - 2,070,000 BTU/HR MODELS



R = RELAYS LOCATED ON CONTROL PANEL

R = RELAYS LOCATED IN WIRING BOX

= LEDS LOCATED ON DISPLAY BOARD

= OPTIONAL DIN RAIL CONNECTORS LOCATED IN ELECTRICAL WIRING BOX.

NOTES:
(1) WHERE POSSIBLE, ALL SWITCHES AND CIRCUITRY ARE SHOWN IN THEIR AT REST STATES.
(2) ADDITION OF ENERGY MANAGEMENT SYSTEMS OR OPTIONAL LIMIT SWITCHES TO THE TERMINAL STRIP REQUIRE THE REMOVAL OF SOME OF THE SHORTING BARS FROM THE TERMINAL STRIP.
(3) SCHEMATIC IS WIRING DIAGRAM, REFER TO ACTUAL COMPONENTS FOR EXACT TERMINAL LOCATIONS.
(4) WHEN REPLACING DAMAGED WIRING, USE EQUIVALENT TYPE AND GAUGE.

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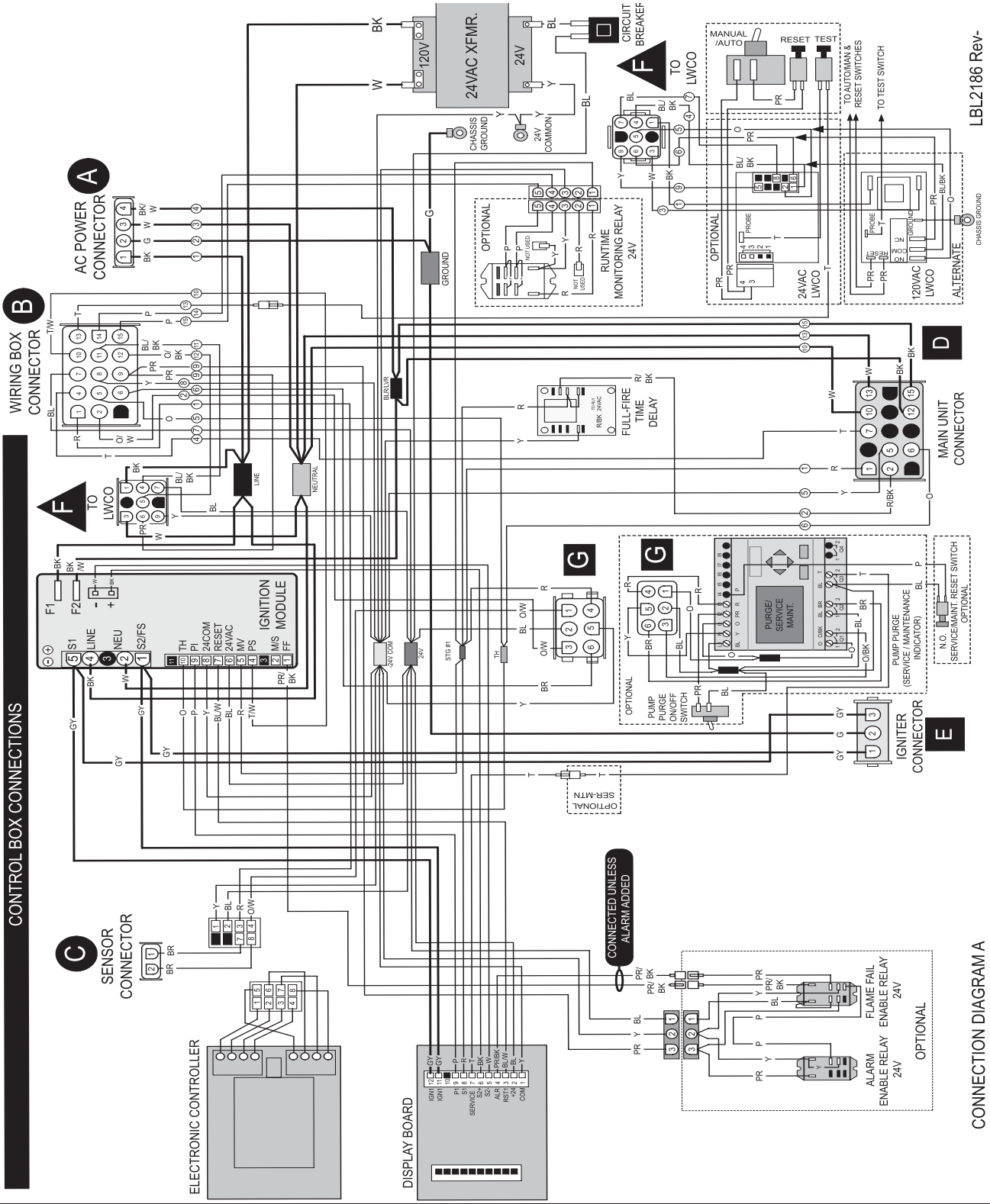
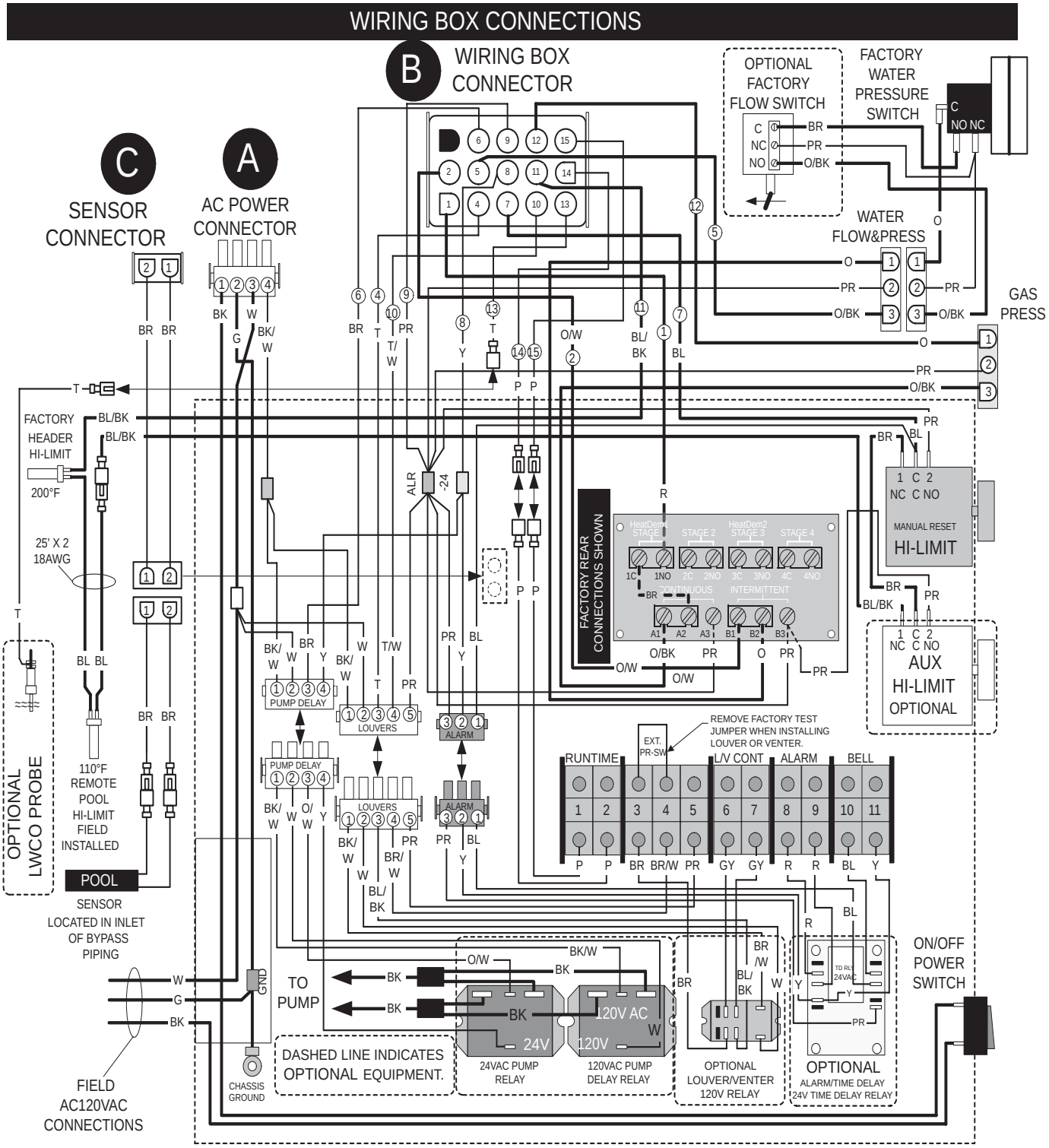
CONTROL BOX CONNECTIONS 990,000 - 2,070,000 BTU/HR MODELS



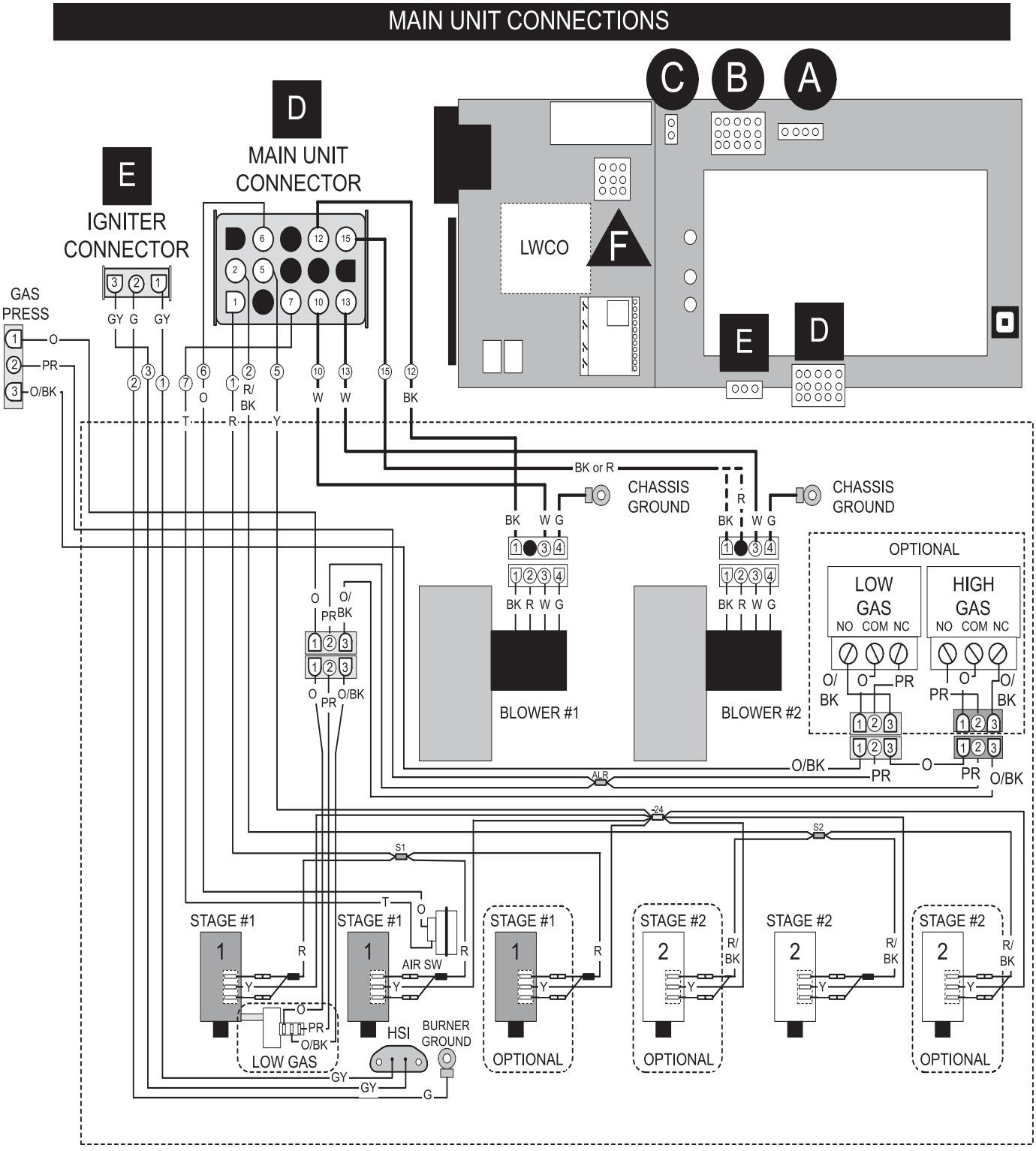
Commercial Pool Heaters

WIRING BOX CONNECTIONS 990,000 - 2,070,000 BTU/HR MODELS



CONNECTION DIAGRAM B

WIRING BOX CONNECTIONS 990,000 - 2,070,000 BTU/HR MODELS (CONTINUED)



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